

**USER MANUAL**  
**FOR THE**  
**GENTEX Simulator,**  
**I-TELEX Client**  
**and**  
**SIEMENS M190 Simulator**



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## Introduction.

The Telex Exchange / Gentex Simulator, as described in this manual, is a side effect of the unofficial cooperation between the Danish Cold War Museum, located at Stevns Fortress, and the Danish IT Historical Society, DDHF.

Both institutions wished to use the stocked teleprinters for educational purposes. Although these two institutions have vastly different purposes and visitor types, they share a common area: communication.

Originally, the system was 'just' a modernised version of the GENTEX network used by European PTT's for the exchange of telegrams. The origin of this network goes back to the 1930's, where a small exchange was set up to serve the Hamburg-Berlin area (Germany). <sup>1</sup>

One of the benefits in using Gentex (or teleprinters in general) was that the originating station could activate a function called answer-back in the receiving station, resulting in the transmission of a text string from the receiving station to the originator.. This would prove that the connection had been active during the session, which again had the effect that a piece of telex paper (with both answer-backs at both ends) was considered to be a legal document.

Another good thing was that the message could be sent in the absence of the receiver, which was very useful when dealing between different time zones.

Many other nets, using the same technology, existed, such as Police, Railroad, Air Traffic Control, seat reservation, etc. Rumor has it that the net used by the STASI, the East German Secret Police, exceeded the East German Post network in capacity, speed, and reliability.

Teleprinters were also used for receiving telemetry signals from satellites<sup>2</sup>; ESA, the European Space Agency, had (amongst others) receiving stations in Kiruna (Sweden) and Chile. The messages were then relayed to Darmstadt (Germany) for computer processing.

My thanks go to the guys from the i-Telex community, especially Heinz Blumberg, DC4GL, who was a very patient test participant, and Fred Sonnenrein, who was instrumental in making me understand how Telnet works. It was a very steep learning curve.

For proof reading, my thanks go to Russ, WA3FRP, and Alf Fisher, G3WSD. Without their cooperation, things would have been a lot worse :-)

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<sup>1</sup> The full-sized European Gentex network functioned until the mid 1980's, where it was, in fact, killed off by the appearance of the telefax. However, in some remote areas, for example in Bangla Desh, comparable systems are still being used, mostly because of bad or missing telecommunication infrastructure.

<sup>2</sup> Primarily because the date could be punched in paper tape, which was a convenient input media for computers

## **Danish Data Historical Society**

Dansk Data Historisk Forening, or Danish Data Historical Society, located in Ballerup, a suburb to Copenhagen, is a society working with collecting and conservation of Danish IT history.

Spreading the knowledge of this history, and the impact it had on the global industry, is accomplished by spreading the history of the companies and people which pushed the industry forward.

As a part of these activities, the Society has created an internet site at [www.datamuseum.dk](http://www.datamuseum.dk)

Apart from that, the Society has exhibitions and holds lectures. The Society also has the possibility to lend parts of the collection for educational purposes, films, etc.

We also strive to collect, restore and conserve effects (hardware, software, documentation, books) having (had) an impact on Danish IT history, with special focus on Danish design, development and/or production.

The restoration of old systems aims to reactivate systems, so the original function and use can be communicated to new generations.

Finn Verner Nielsen

DDHF Chairman  
2016.12.06

## 1. System Description

As seen from a users point of view, the original version of the Simulator is a near-copy of the now obsolete Gentex system, a teleprinter exchange system used until the mid-80's by primarily European PTT's for the exchange of telegrams and service messages.

Below, you can see the business end of the telegraph office in The Hague (Netherlands) in the mid 1960's.



The Gentex system worked, in principle, very much like a telephone system: press a button, dial a number, and wait for the connection to be established.

The communication started with printing the time-of-day, and a request for the client's answer-back, so you could verify that you were talking to the correct office/client.

You would then activate your own answerback, so the recipient could see who HE was talking to.

If a connection could not be established, an error message was printed at the senders station, indicating what went wrong, e.g. 'OCC' for 'occupied', 'DER' for 'Derange' (French for 'out of order'), 'NA' for 'Not Allowed', etc.

Not all teleprinters in the world could talk directly to each other, mainly because of speed differences, or because of political issues. Gentex used 50 bps by definition (about 7 characters per second); US systems used 45.45, which could be the reason that the telegraph office in Montreal (Canada)

had a special machine, running at 50 bps, connected to the Dutch system<sup>3</sup>.

The 50 bps speed corresponds roughly to what a trained operator can accomplish on a mechanical keyboard. A number of 'high-speed' circuits used 110 bps, but I have only seen them being used for transmission of pre-recorded messages or data from satellites, and only on leased lines.<sup>4</sup>

The (then) Eastern Block cities of Warszawa (Poland), Prag (Czechoslovakia) and Berlin (GDR) also had connections into the Dutch system, probably to achieve a 'firewall' between the Gentex system and the communication systems that existed in the Eastern Block. This was very useful when e.g. Frankfurt/Main (Federal Republic) had to contact their colleagues in East-Berlin, which was normally strictly forbidden.

As this Simulator is software based, we do not have speed (or other) problems normally associated with this kind of communication, apart from the fact that the US- standard speed of 45.45 bps cannot be obtained with standard serial adapters

A number of enhancements have been added to the original Simulator :

- sending / receiving e-mails
- communication with 'outside' customers via Internet
- support of Siemens M190 encryption
- 'voicemail' routine so you can leave messages without having an active printer.

#### System Requirements

- PC with Windows (preferably Windows XP or better, but Windows 2000 will do);
- almost every processor will do; the development system was a Windows 2000 based system with a 233 Mhz processor and 256 MB of RAM;
- expansion card(s) with COM ports, with lowest speed 50 bps;
- control box(es), to be fabricated locally
- teleprinter(s) (Siemens, Teletype, GNT, ...)
- Delphi 6 (if you want to modify the source text)

---

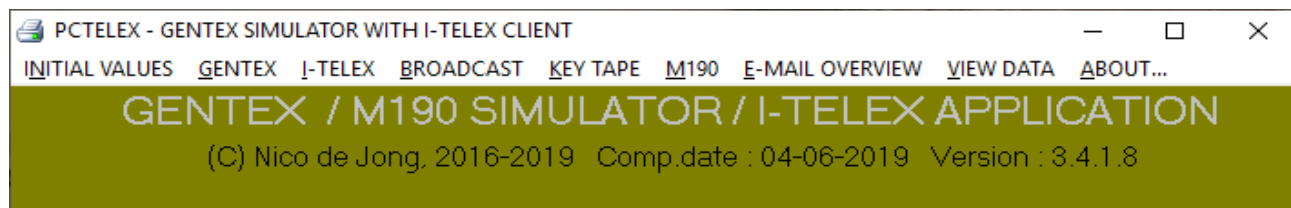
<sup>3</sup> According to WA3FRP the statement is not entirely correct..He explains: The telephone company operated a system called TWX. That was a 45.45 baud system. However, the Western Union Telegraph Company operated a 50 baud Telex network. Eventually, in the 1970s, the telephone company sold the TWX network to the Telegraph Company and all 45.45 baud machines were converted to either the new ASCII standard or moved to a 50 baud Telex service. I would say that some US -based teleprinters operated at 45.45 baud. There were also other issues. Many of these 45.45 baud machines, operated and maintained by the telephone company, had no answer-back capability. This network of machines operated as a closed network for many years until Western Union designed and operated an interface to this network and allowed communication, back and forth, to any 45.45 baud machine that was equipped with an answer-back.

<sup>4</sup> Not the complete truth; the Teletype corporation sold 110 bps machines. I do not know whether they were used for telegraph purposes.

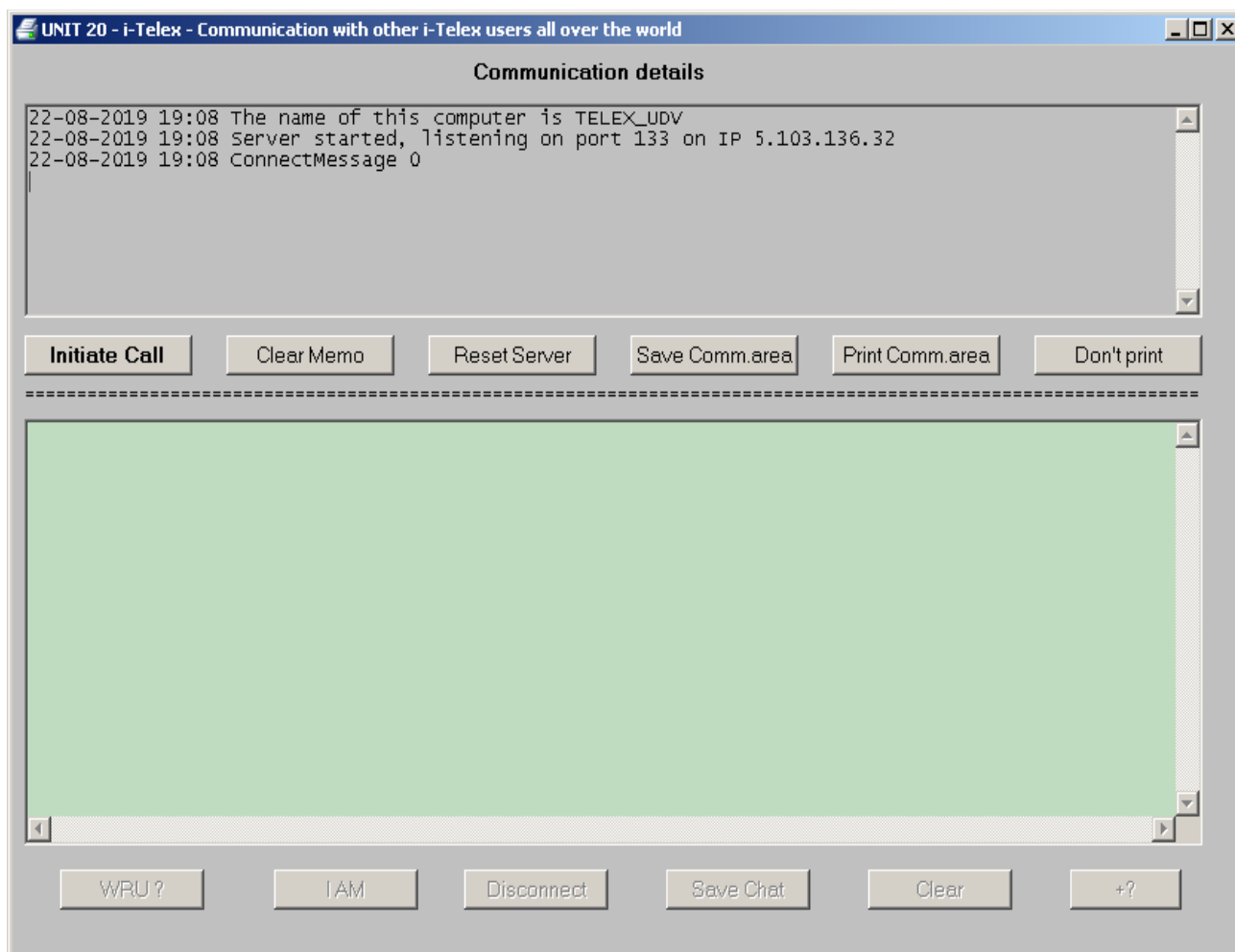


## 2. Main Menu

When started, 3 screens are displayed, partially on top of each other :



The next screen takes care of the i-Telex communication :



The big green window is used for the communication between the parties.

Last but not least we can see the RUN screen, which controls the Gentex part of the program.

UNIT10 - TELEPRINTER EXCHANGE

!! REAL COMMUNICATION MAKES NOISE !!

TELEPRINTER EXCHANGE FOR THE STEVNS FORTRESS, (C) DDHF, 2016-2019

serverlogic			Connected to	
31000 sysop dk		91		
31095 SYSOPGTX DK	READY	20	RESET	
E-mail	GRAVEYARD	99	RESET	
31067 GENTEX DK	READY	20	RESET	
16600 FOTEX DK	GRAVEYARD	99	RESET	
11680 MNTREAL CA	READY	20	RESET	
31000 INFO DK	READY	20	RESET	
			RESET	
			RESET	
			RESET	
			RESET	

Connect

Listening

DSR

CTS

CD

Telegram name

Subscriber / E-mail address

517

518 ETATPRIO

527

DDHF

HATE

IMPISH

LND799 A

NRC1NIIC

Preview

11680 MNTREAL CA

16600 FOTEX DK

31000 INFO DK

31067 GENTEX DK

Send Message

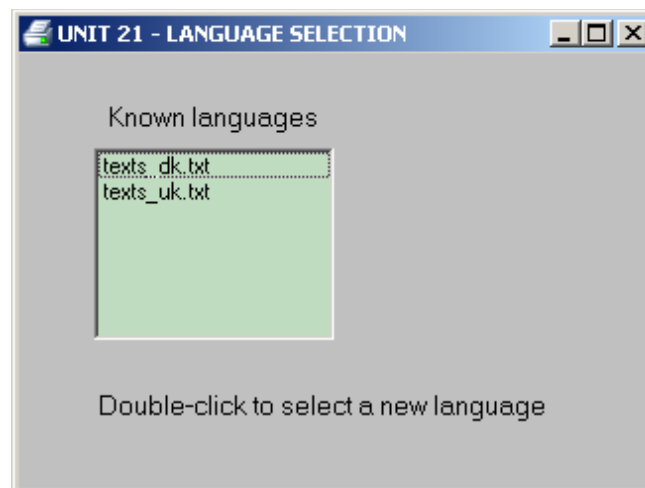
5 No such port(Function 6 returncode -1)

## 2.1 Housekeeping / Initial values

The first thing to do when installing or moving a system is to check / modify the parameters. This is accomplished through the **INITIAL VALUES** menu.

Here we find some screens used to define customer dependent parameters. Most parameters will only need to be defined once, although changes can be necessary when the system is expanded and / or changed.

### 2.1.1 Language



In order to accommodate non-English speaking users, we can change the texts displayed on the screen, by selecting one of the languages shown. Some error texts are not translated, as they are embedded in 'foreign' units.

New languages can be implemented by copying one of the existing ones to a new text file with the name TEXTS\_?.TXT, where ?? represents the country/language, e.g. ES for Spain. That done, you can start translating.

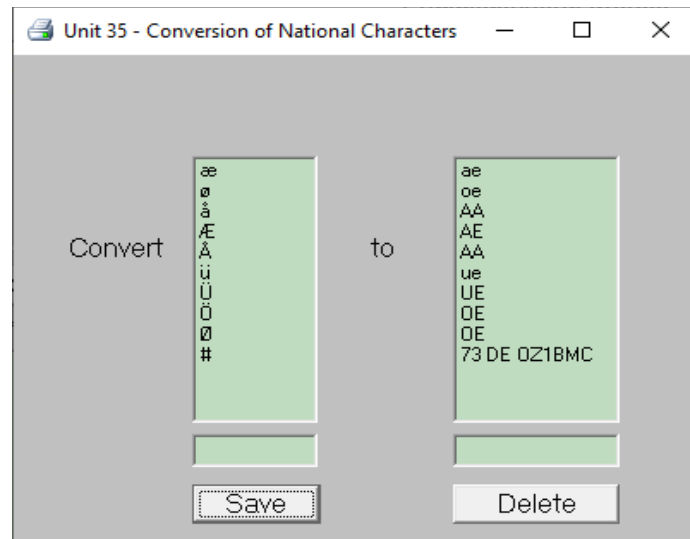
When you then select the file with the translated texts, the file will be copied to TEXTS\_DEF.TXT, which is the textfile used by the program ('DEF' being Default)

You can find the files in the `c:\pctel\userdata` directory.

Seeing a label or other text showing a number, indicates that the text with that number is missing from the language file texts\_def.txt. You can probably find it in one of the other language files.

If not, please send me an e-mail at [nicodejong@outlook.dk](mailto:nicodejong@outlook.dk) or [nico@farumdata.dk](mailto:nico@farumdata.dk)

### 2.1.2 National Characters



Most languages have national characters, such as the Danish Æ Ø Å. However, ITA-2<sup>5</sup> based teleprinters can accommodate only 3 special characters.

Sending national characters to a different kind of printer, will make the printer print something else, or maybe activate a special function. The solution to this problem is to set up a table, converting special characters to something within the ITA-2 character set.

If you need a text which is not a direct translation of the national character, you can use a non-ITA2 character, for example the hash character ('#' or 'garden gate' as we call it in Danish) to generate a long(er) text.

#### Adding a value :

Write the original value in the lefthand editbox, and the converted value to the right.

Press **Save**.

#### Changing a value :

Select the original value in the lefthand listbox. The values are now written to the edit boxes

Change the value(s) and press **Save**.

#### Deleting a value :

Select the original value in the lefthand listbox and press **Delete**

You should enter uppercase AND lowercase values in the table, as the automatic UpperCase conversion routine only works for a..z.

The conversion is done one element at the time, so the table sequence has an impact on the output. Example: if you first convert 'S' to something, and then try to convert 'SB', this conversion will never take place, because S is already converted. Just swap them around, and things will be fine.

---

5 The character set used in most teleprinters is the ITA-2 alphabet, which is a 5-bit code, as opposed to ASCII, which is an 8-bit code.

### 2.1.3 Properties

In order to be able to use various types of teleprinters (they can have different speed, character set, electromechanical properties, etc.) in the same system, some parameters must be defined before you can use the system.

	Subscriber nbr	Location or name	Answerback	COM port properties	Crypto	KEY TAPE
COM 3	31067		gentex 1 dk	50,5,2,None,ASR,	<input type="checkbox"/>	
COM 4	22372		22372 smk dk	50,5,2,None,ASR,	<input checked="" type="checkbox"/>	nicotest.IMG
COM 5	11680		11680 mntreal ca	50,5,1,None,ASR,	<input checked="" type="checkbox"/>	TAPE1.IMG
COM 6	16600		16600 FOTEX DK	50,5,1,None,ASR,	<input type="checkbox"/>	
COM 7				50,5,1,None,ASR,	<input type="checkbox"/>	
COM 8				50,5,1,None,ASR,	<input type="checkbox"/>	
COM 9					<input type="checkbox"/>	
COM 10					<input type="checkbox"/>	

**PORT PROPERTIES**

Bit Rate: 50, 75, 110, 150, 300, 600, 1200  
Databits: 5, 6, 7, 8  
Stopbits: 1, 2  
Parity: None, Odd, Even, Mark, Space  
☒ ASR  
☐ KSR  
☐ RO

'Footer' after e-mail: This mail was sent from Nico's TelexExchange

Save

bølge.IMG  
CODETAP2.IMG  
codetape.IMG  
KODETAPE.IMG  
nicotest.IMG  
TAPE1.IMG  
TAPE2.IMG  
TEST.IMG  
test1.IMG

The screen defines the number of teleprinters, the properties of each one, and some other odds and ends. As you can see, there is presently support for 8 teleprinters. However, the number of printers "visible" to the system, is defined by the field **Number of Teleprinters**

**First COM port to be used** depends on your system. Our recommendation is that you connect your teleprinter(s) to an expansion card. Normally, the lowest available COM port address will be COM3.<sup>6</sup>

**SystemOperator Gentex** is the subscriber number a **local** teleprinter operator uses to call the

<sup>6</sup> This is because many standard COM ports do not support 50 bps, the Baud rate we need to operate a (European) teleprinter.

system operator. When the number is called, a window simulating a teleprinter, will be presented<sup>7</sup>

**Answerback** The Answer-back identifying the operator, will be sent to the calling teleprinter, so the operator can verify that a connection has been established. The operator at the other end can also request the answerback by typing the **WRU** button<sup>8</sup>; operators using electronic terminals can use a @ (commercial AT).

The bottom line can be used to define a 'footer' following sent e-mails, like "This e-mail originates from the Telex exchange in the Danish Cold War Museum". This line can be changed in the language files. If you do not want a footer : remove the text in the language file, but don't remove the text number.

Now let's take a look at the parameters defining a specific teleprinter.

- **Subscriber number**. This is the number to be used when a subscriber wishes to call another local subscriber. If your teleprinters have a built-in answerback with a 5 digit number, you should use that number. It is also shown in i-Telex' Greetings Message
- **Location / Name** can be used to tell where a specific subscriber is located, or which function the subscriber fulfills (use is optional).
- **Answerback**, is the built-in (or preferred) answerback. This value is used so the calling operator can ensure that he is connected to the correct number. Most teleprinters have a built-in hard-coded device programmed with this number, e.g. 31068 RA GV NL, which was the primary receiver in The Hague (NL). Others have just a text, like 'buitenzaken gv' which was the Foreign Ministry in The Hague. The weirdest one I've seen was 'c ?v'.
- **COM port properties** defines a teleprinters physical properties, like speed, word lengths, etc. In this case, we have selected COM 3. The COM port properties are 'unpacked' to the list boxes below Port Properties. When you then select e.g. a different speed, the properties will be 'repacked' and written back to the original field.
- **Crypto** is used if your installation has a Siemens Encryption Unit (M190). The use of this field will be discussed in the relevant chapter. In short : it enables normal teleprinters to decode encrypted messages. More about that later.
- **ASR, KSR and RO** are currently not in use. They describe the type of teleprinter : **Automatic Send Receive** (meaning that it has a built-in paper tape punch and a built-in paper tape reader, so prepunched tapes can be transmitted), **Keyboard Send Receive** (meaning that the device is manual-only) and **Receive Only** (meaning that it has no keyboard, and thus can be used for print only)

Should any of those parameters need to be changed, you can press the left-most button, (COM...), which will show the present values in the boxes belonging to "Port Properties".

Changing the values will result in updates higher up.

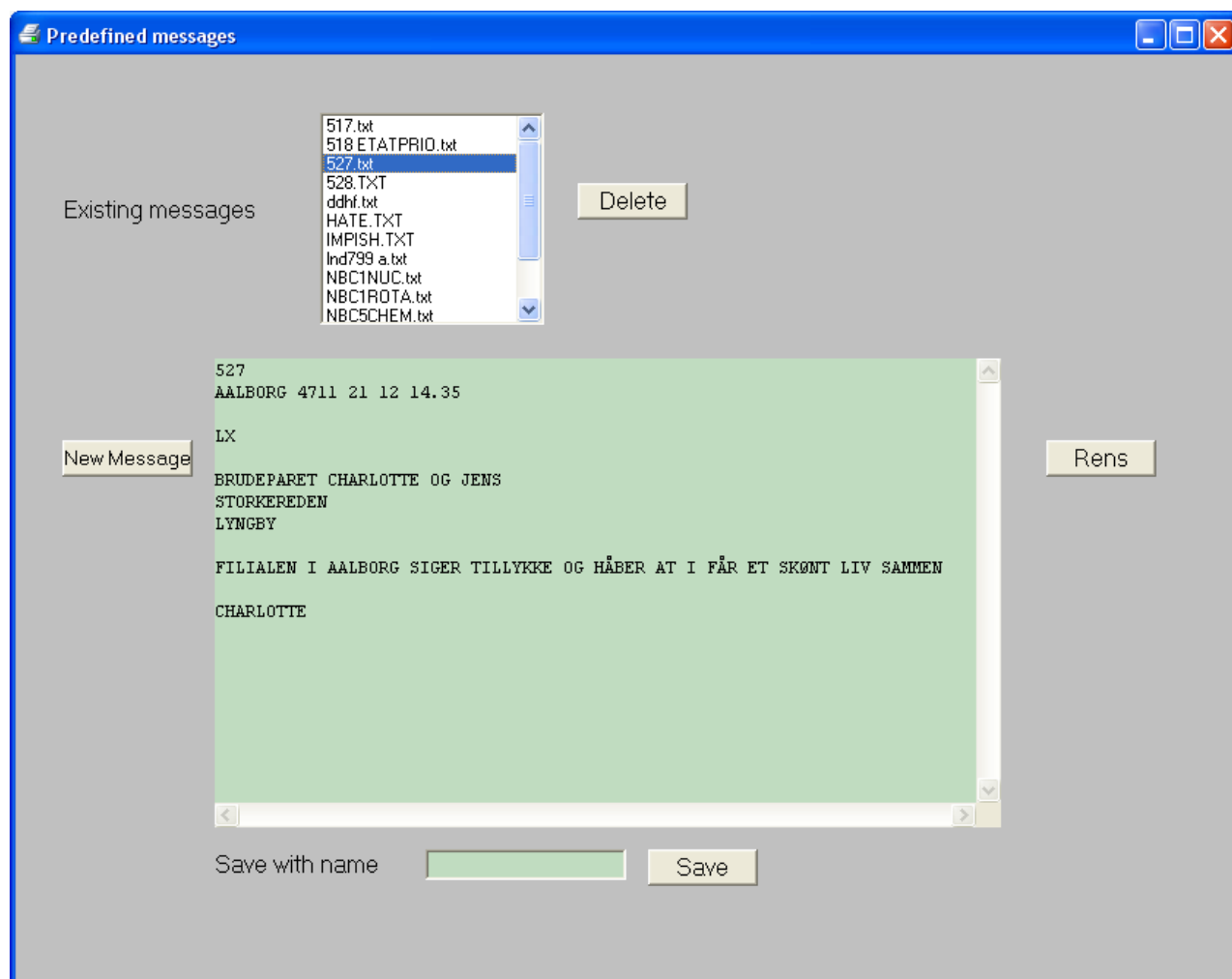
---

<sup>7</sup> This number is not to be confused with the i-Telex subscriber number; it is strictly Local.

<sup>8</sup> Many teleprinters use a special character, looking very much like the Maltese Cross

### 2.1.4 Predefined messages

Predefined messages can be very useful, for example for service messages, telegrams, broadcast messages, etc.

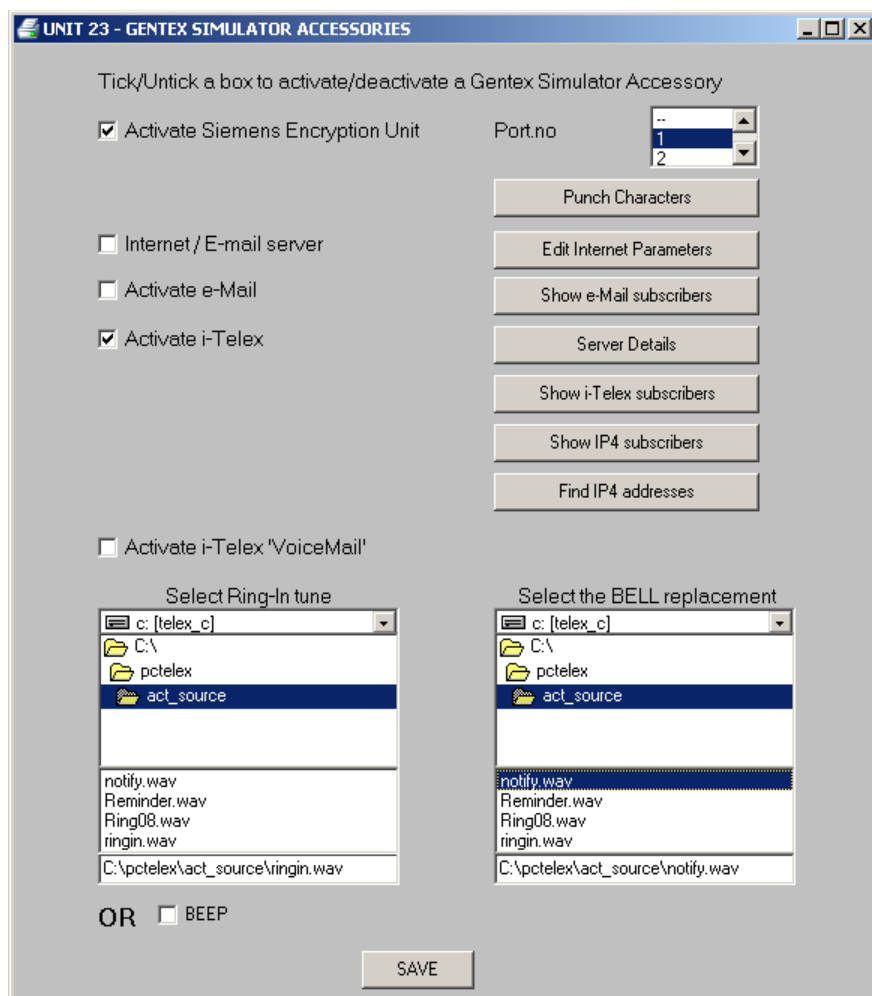


An existing message, in this case 527.txt, showing a Danish telegram congratulating a newly married couple, can be displayed by selecting a name in the listbox. The message can be deleted by pressing **DELETE**.

When this message is sent to a teleprinter, the danish characters will be translated.

Existing messages can also be used as the basis for new ones : just select a message, change it as needed, and **SAVE** it under a new name.

### 2.1.5 Accessories



As mentioned earlier, the program has been expanded a great deal since the original version. These expansions can be (de)activated according to your wishes.

Any function not needed, should be deactivated, so it does not take resources (in this case : processor time) from the other functions.

Some functions are activated by just checking the box or selecting a .WAV file, other functions also need some parameters.

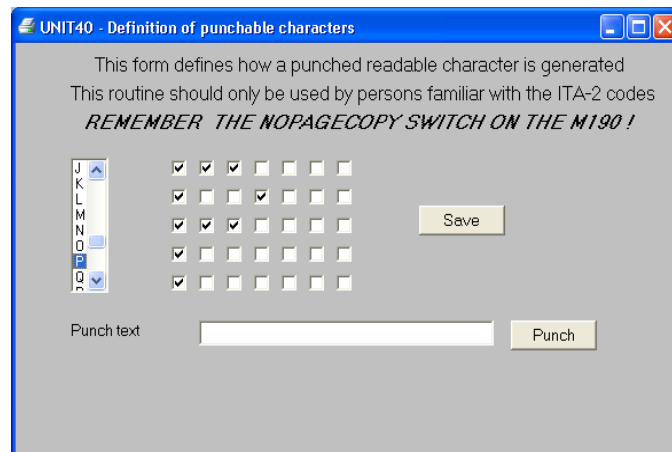


### 2.1.5.1 Activate Siemens M190 encryption/decryption unit

The system supports the Siemens encryption unit M190. In the '80's, identical units were used on the hot-line between Washington and Moscow, until they were replaced by IBM PC's.

When the function is activated, you need to tell the system which COM port connects to the teleprinter.

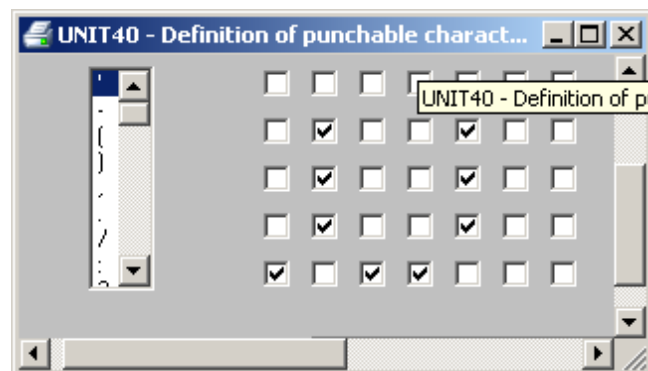
#### Definition of readable characters



This function enables the punching of readable characters on a key tape, so you can identify the tape from its header, which by the way is identical to the filename used for the key tape.

A character can be anything from 1 to 7 columns wide (e.g. an apostroph vs. a W). The character matrix can be redefined if you are not satisfied with the standard.

It also creates the possibility to define non-standard characters, as long as they fit. Suppose you want to be able to punch a micro symbol (  $\mu$  ). This can be done by changing the definition of e,g, the apostroph to



Another nice function is to be able to write a text and have it punched in readable text. Visiting kids can write their name in the edit field, and then have it punched. It is strongly recommended to activate the NO PAGE COPY button on the encryption unit. Punching on normal teleprinters is NOT recommended.

### 2.1.5.2 Internet / e-Mail Server

POP3 server	<input type="text" value="mail.farumdata.dk"/>	(Something like MAIL.XXX.COM)
POP3 port	<input type="text" value="995"/>	
SMTP server	<input type="text" value="mail.farumdata.dk"/>	(Something like SMTP.XXX.COM)
SMTP port	<input type="text" value="25"/>	Often 25 or 587
Proxy port	<input type="text"/>	
E-mail Subscriber	<input type="text" value="zczc@farumdata.dk"/>	E-mail address for this system
Password	<input type="text" value="nnnn"/>	

These values are used when you want to receive e-mail messages and print them to a printer, or if you want to use the simulator to send e-mails.

The values to be used for the top 5 parameters, are specified by your ISP.

### 2.1.5.3 E-mail Subscribers

UNIT 01 - DEFINE E-MAIL SUBSCRIBERS

Known subscribers

12345  
24801  
31999

wa3frp@xxx.com

Save

Delete

-----

New subscriber

Add

The primary goal of the E-mail function is to show the unwashed that information can be shared between utterly different communication systems.

This is accomplished by assigning an alias to an e-mail address, so the program thinks of it as a normal teleprinter.

This is done by writing a number, to be used as the alias, followed by a normal e-mail address. Now press **ADD**. The number of the new subscriber will now be shown in the listbox.

The address can be changed by writing the number just as before; this will show the present E-mail address which then can be modified. The number can not be changed; if you need to do that, you must delete the address and enter it again.

Existing subscribers can be deleted by selecting the number in the listbox and press **DELETE**

It goes without saying that it is not allowed to use the same number for a teleprinter and for an alias.

Remember that the e-mail function only handles ITA-2 characters, corresponding to what you can see on the teleprinter keyboard. Other characters are replaced by a period before transmission takes place.

#### 2.1.5.4 i-Telex Subscribers

A number of teleprinter enthusiasts in Germany came up with the idea to develop a way making it possible for them to communicate through the Internet using teleprinters.

When I first heard of the system, there seemed to be some shortcomings, but these have now largely been removed.

Seen from my side of the fence, the main shortcomings at the time were :

- only 1 : 1 communication
- speeds cannot easily be mixed (receiver and sender equipment must have same speed)

However, the system also has advantages :

- communication not limited to 'in house' traffic
- easy implementation
- communication via Internet

Combining those two principles into one program, gives us the best of both worlds.

If you are interested in the nuts and bolts of i-Telex, you can pay a visit to [www.i-Telex.net](http://www.i-Telex.net)

Known Subscribers		
21100	Nico, København	1x glasstty, simulator
31067	nico, gentex simulator	1 glasstty, 1x T100S
31068	NICO, GENTEXSIMULATOR	1X GLASSTTY, 2x T100Z/M190
31069	Nico, Nørre Alslev	1x glasstty, simulator
531001	Fred, Braunschweig	(undefined)
55571	Henning, Blumenhagen	(undefined)
61663	Kenneth Gartland, Canada	(undefined)
781272	Fred, Braunschweig	(undefined)
834328	Russ	Western Union 28ASR
8517242	Heinz	(undefined)
92612	Teilnehmerliste	(undefined)

New Subscriber		
New Subscriber	Location	Details
<input type="text"/>	<input type="text"/>	<input type="text"/>

What we see here, is a local directory of i-Telex subscribers.

Following a request for enabling contact with subscribers without i-Telex connection, an extra directory has been implemented.

The screenshot shows a window titled "UNIT29 - Phone book for clients without i-Telex connection". Inside, there is a section titled "Presently known clients" which contains a list of clients. The first client is highlighted in blue and shows the IP address "5.103.136.32", port number "134", and name "31068". To the right of this list is a "Delete" button. Below the list, there are three input fields: "IP4 Address" with "5.103.136.32", "Portnbr" with "134", and "Name etc." with "31068". To the right of these fields is an "Add/Update" button. At the bottom center is a "Save/Exit" button.

Before being able to establish a connection, you should make sure that you have the correct IP4 address and the port number you are to use.

For the client, this means that the firewall must be 'opened' for this port.

The router must also allow for a redirect/pass, but how to do this, is beyond the scope of this manual.

The screenshot shows a window titled "UNIT22 - FIND IP4 ADDRESSES". It has two rows of input fields. The first row is for a website, with "WWW." as a label, "farumdata.dk" in the input field, and "37.59.198.205" in the output field. The second row is for a PC, with "PC name" as a label, "laptop" in the input field, and "192.168.1.12" in the output field. To the right of the website row is a button labeled "Find Public IP4 address", and to the right of the PC row is a button labeled "Find Local IP4 address". Below these fields is a note in italics: "NB : for unknown reasons, some requests consequently fail. e.g. www.megahost.dk; while others, e.g. www.farumdata.dk; do not fail. The problem is under investigation."

This small screen allows you to

- find the public IP4 address belonging to a website
- find the logical name of the PC, and the address it is known to to the router.

#### 2.1.5.5 Voice Mail Recorder

Another recent addition to the system is the implementation of a "voice mail recorder".

This is of course a contradiction in terms when speaking about mechanical devices, but it shows what is meant.

When this switch is set, incoming messages will be saved in special directories, corresponding to the numbers of the teleprinters in question. The messages can then be retrieved, read, printed, forwarded to a teleprinter, or deleted.

When the switch is (de)activated when the Server is running, an appropriate text will be shown in the Communication Details form (unit 20).

### 2.1.5.6 Server Parameters

	Server Parameters	Alternative Server	Spare Server
i_telex servername	sonnibs.no-ip.org		
i_telex hostport	11811		
IP address of own internet router	5.103.136.32	80.167.70.138	
Local servername	*	*	
Local server IP address	192.168.1.2	192.168.0.6	
Local server port 1	11111	133	
Local server port 2	133	132	
Subscribernumber simulator	31069	21100	
Answerback for Simulator	31069 gentex dk	21100A KBHVN DK	
Local number for SysOp	31069	21100	
Answerback for SysOp	31069 sysop dk	21100 SYSOP DK	
	<input type="checkbox"/> Use this server	<input checked="" type="checkbox"/> Use this server	<input type="checkbox"/> Use this server

Save

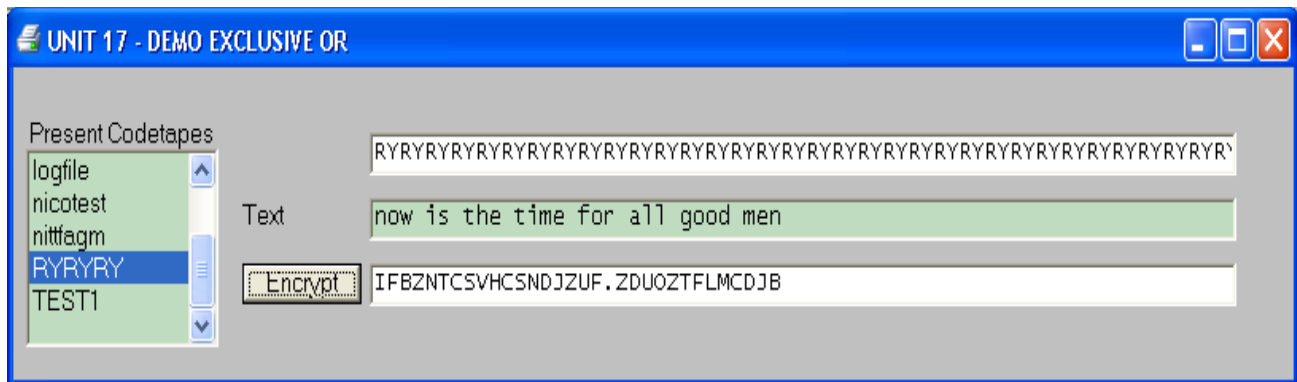
As you can see, support is offered for a normal and for alternative servers. This can be quite useful when you need to access a different server.

The screen is divided in a number of sections (hardly visible....) :

- information regarding on how to access the i-Telex server;
- the address of your router, as seen from the program (normally 192.168.1.1 or 192.168.0.1);
- the name and address of your router, as seen from the internet side<sup>9</sup> and the ports you have set aside for communication;
- the i-Telex subscriber number(s) of the server(s); these numbers are to be confirmed by the i-Telex administrator ([www.i-Telex.net](http://www.i-Telex.net));
- the subscriber numbers of the i-Telex operator in your system. The use of this number is relevant when you want your system to run 24/7, but do not want to have your physical printers running. In the near future, a special function "Stand Alone" will be developed, so a call to the simulator (in this case 31067) will be redirected directly to the i-Telex operator.
- If in doubt regarding your own IP address, you can enter the name of your home page. and find your public IP address.
- Finding your local address can be very handy when working on a local network, where you cannot be 100% sure that you get the same local address every time.

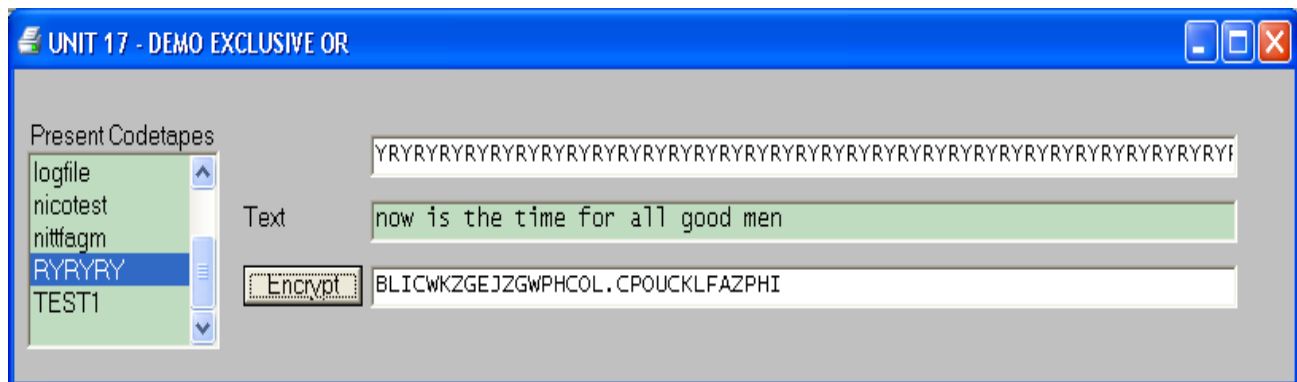
<sup>9</sup> The name will normally be an asterix ( \* )

### 2.1.6 Demonstration XOR



This routine is a quick visual demonstration on how a text can look like after encryption with a specific key tape.

The screenshot below shows the same original text, but with the key tape one position off.



This small example shows clearly how important it is to have rigid routines when it comes to the handling of encrypted messages.



## 2.2 Gentex

TELEPRINTER EXCHANGE / I-TELEX CLIENT / M190 SIMULATOR, (C) DDHF, 2016-2018

Serverlogic  
I-TLX 31000 sysop a dk  
GTX 31095 sysop a dk  
E-mail  
22372 SMK DK  
23683 DAMIL DK  
11680 MNTREAL CA  
16600 FOTEX DK

Connected to

DSR CTS CD

Listening

Telegram name

Subscriber / E-mail address

Preview

Send Message

6 No such port(Function 6 returncode -1)  
7 No such port(Function 6 returncode -1)  
7 No such port(Function 6 returncode -1)  
6 No such port(Function 6 returncode -1)

When all boring stuff has been dealt with, we can look at the RUN screen.

At the top, we can see lines with Serverlogic and 2 SysOp's, then a line with the e-mail function, and a number of teleprinters, two of which are in the graveyard state, meaning that they cannot be addressed, possibly because of a missing control box.

The E-mail function is not available, because the function has been switched off (see chapter 2.1.4).

The (simulated) teleprinter is for internal use only; it controls the functions belonging to the i-Telex server / client. The i-Telex SYSOP is also a simulated teleprinter, but we will explain that when we talk about the i-Telex function in detail.

The Gentex SYSOP is in fact the operator. This number can be dialed by the physical teleprinters if they want to talk to the SYSOP.

For every physical teleprinter, a number of fields are found :

- answerback + major status
- (minor) status, showing what the teleprinter is doing resp. waiting for right now

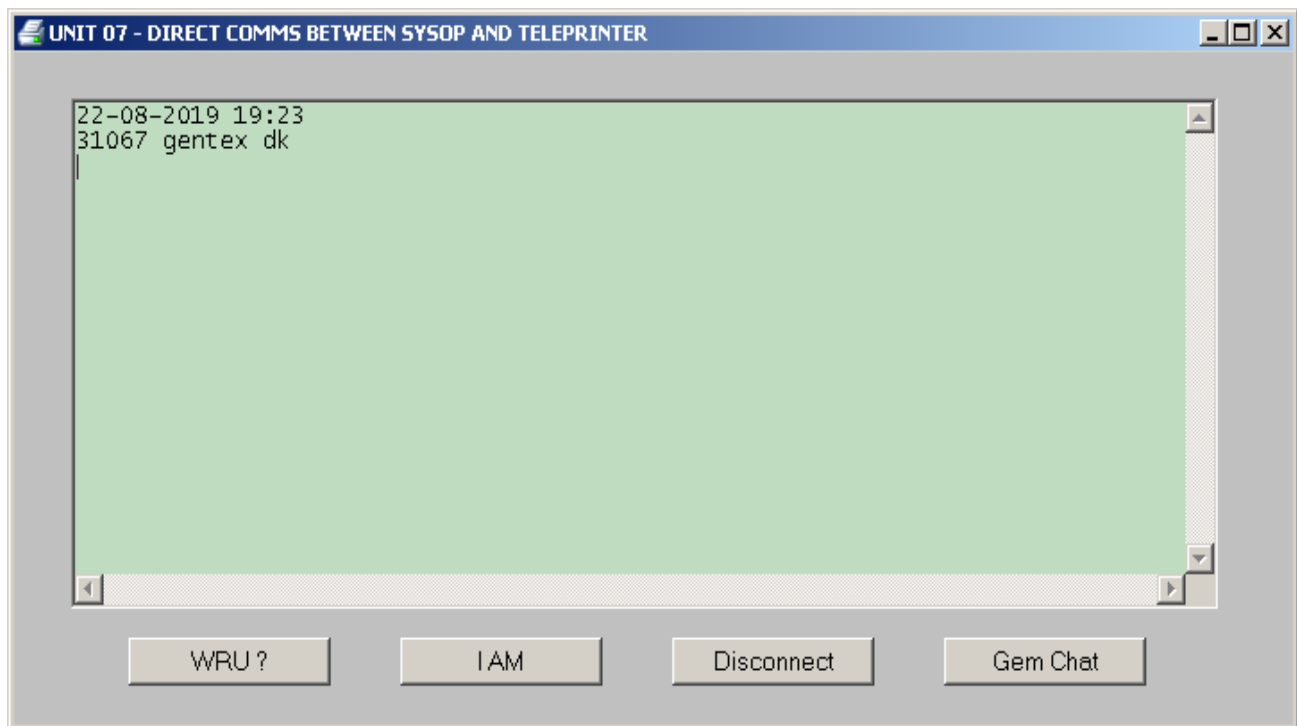
- **RESET** button : if a controlbox is switched off, it cannot be seen by the program. When it is activated again, you can press RESET, which will set all fields relevant to this task to its proper initial values. It is more or less compatible with a soft reset on a PC:
- **Connected to** : shows who is talking to whom
- **CONNECT** : this button enables the systems operator to set up a connection between himself and a specific teleprinter.
- **Listening** : listen in on the connection
- **3 LEDs** : show the status of the control box.
- **MessageName** : the names of one of the predefined messages are shown in this listbox. The messages can be sent to a teleprinter or to an e-mail address.
- **Preview** : before a predefined message is sent, it can be perused and eventually modified.. Then select a recipient and press **SEND Message**
- **SendMessage** Sending an e-mail is rather resource consuming, so it can happen that teleprinters stop working while e-mail is being handled. However, as there is ample buffer capacity in the COM ports, nothing should be lost (I hope), so just continue typing.
- The **bottom listbox** is meant for error messages

There are some special status numbers worth mentioning:

- **00** : Communicating
- **20** : Waiting for action. This is shown on a green background.
- **40** : Local. This could mean that the control box is inn LOCAL state, but it can also indicate that the operator is changing paper or ink ribbon
- **99** : Graveyard. This happens when a teleprinter is defined, but not available, e.g. because the control box is missing. Temporary problems can be solved bye pressing the **RESET** button.

### 2.2.1 Direct communication Operator <> Teleprinter

When the systems operator presses **CONNECT**, the following screen occurs when the connection has been established (here shown with today's date plus the recipient's identifier):



As you can see, it looks like a screen version of the lines written on a printer : time of day and answerback of the receiving station.

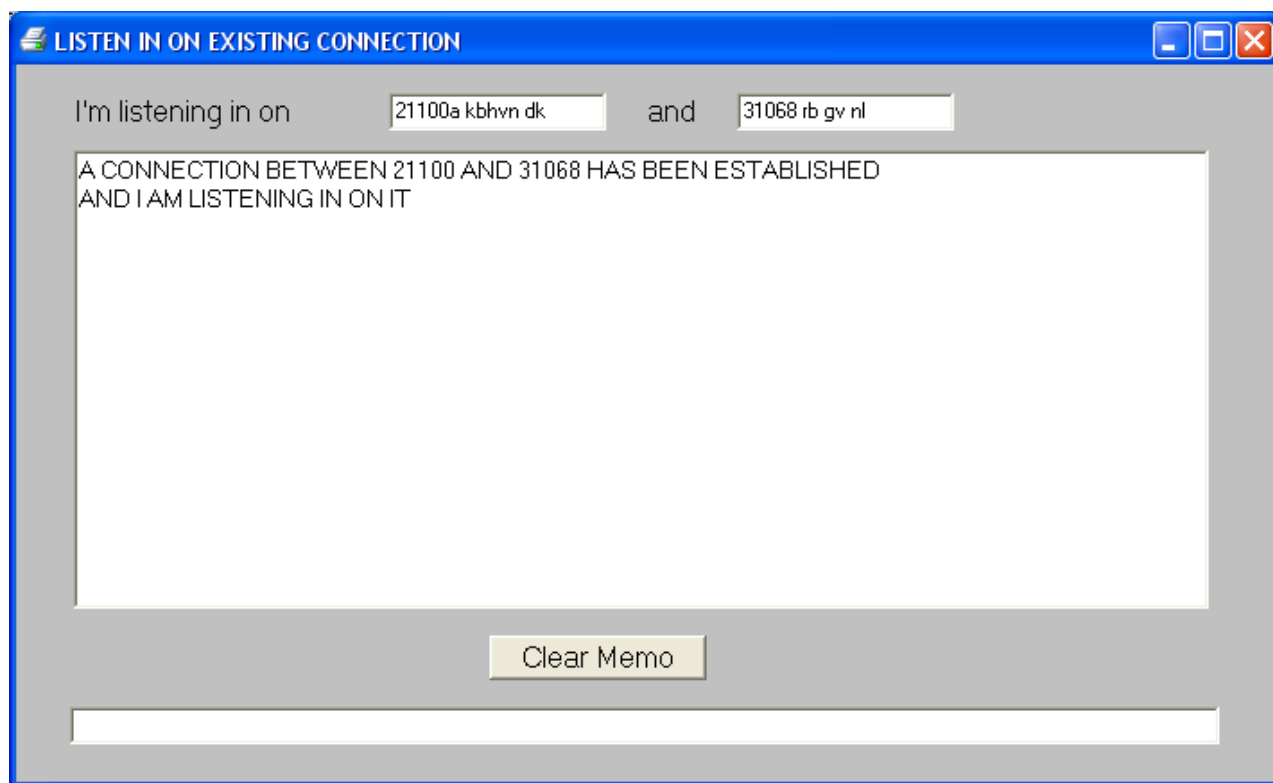
**WRU (Who are you) / Get Answerback** sends a command to the receiving station, which then will trigger the answerback mechanism (if present). Otherwise, the answerback as defined in the Properties screen will be sent.

You can also use the '␣'-character as found on the PC keyboard (shift+4), or a @ (commercial at)

The **Save Chat** button will display a small form, so you have the possibility to save the contents of the Memo. It will save the complete memo, not just the part that you can see.

### 2.2.2 Listening-in

The Systems operator has the possibility to listen-in (or spy if you want) on an existing conversation.



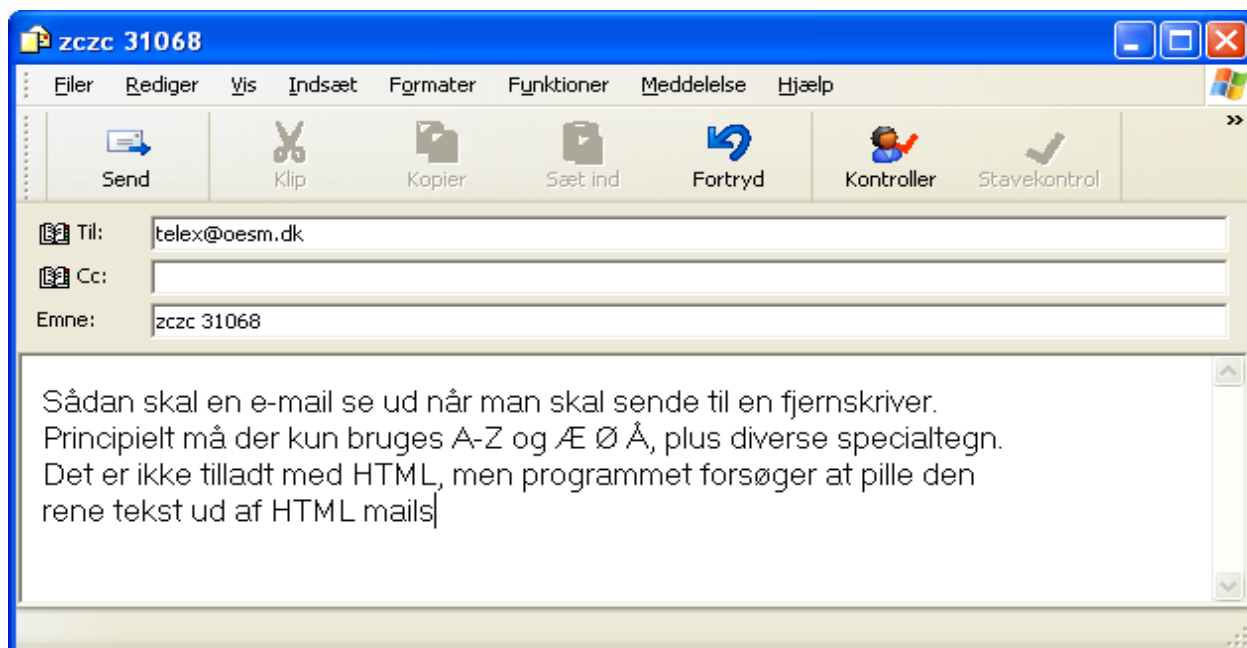
Ongoing 'communication between teleprinters can be listened to when both tasks are in Status 0 (Communicating).

The two top fields shows who we are listening to.

It is not possible to break into the connection, or to write something

At present it is not possible to listen in on an i-Telex connection, but it is in the planning.

### 2.2.3 E-mail function.



In order to be able to send (readable) e-mails to a teleprinter, a number of conditions are to be adhered to.

- 1) The Subject line must contain ZCZC followed by the recipients subscriber number. ZCZC can be in upper or lower case (or mixed, if you want).
- 2) The To: line must contain the e-mail address of the Simulator. In this case, [telex@oesm.dk](mailto:telex@oesm.dk)
- 3) Be careful with national characters like Æ Ø Å Ü etc. They are to be used only if you are sure that they are printed correctly on the other printer.
- 4) Avoid HTML; use plain text only. The system attempts to extract the clear text from the HTML file, but it is not guaranteed to work.
- 5) Should unsupported characters appear (meaning : ASCII characters which are not a part of the ITA-2 character set), they will be replaced by question marks.

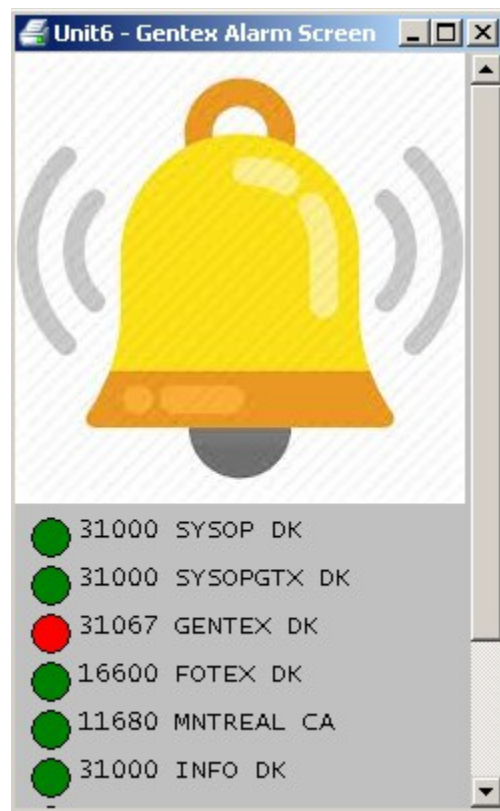
The system will look for e-mails about twice a minute.

When a mail is found with e.g. 'ZCZC 31068' in the Subject line, the mail will be saved in the relevant directory (c:\pctelex\emails\31068\.) The program part handling printer 31068 will then collect the mail and print it.

Received e-mails can be cleaned for disturbing lines, e.g. footers advertising for spamfighters, anti-virus software or competing i-Telex systems.

Please take a look at lines 1050-1054 in a language file; if ANY of those 5 texts appear in a mail, the complete line will be discarded.

### 2.3.4 The Alarm system



Most, if not all, teleprinters have a BELL function, which function it is to alarm the operator that something important is being said.

The problem with a bell is that it can be difficult to hear.

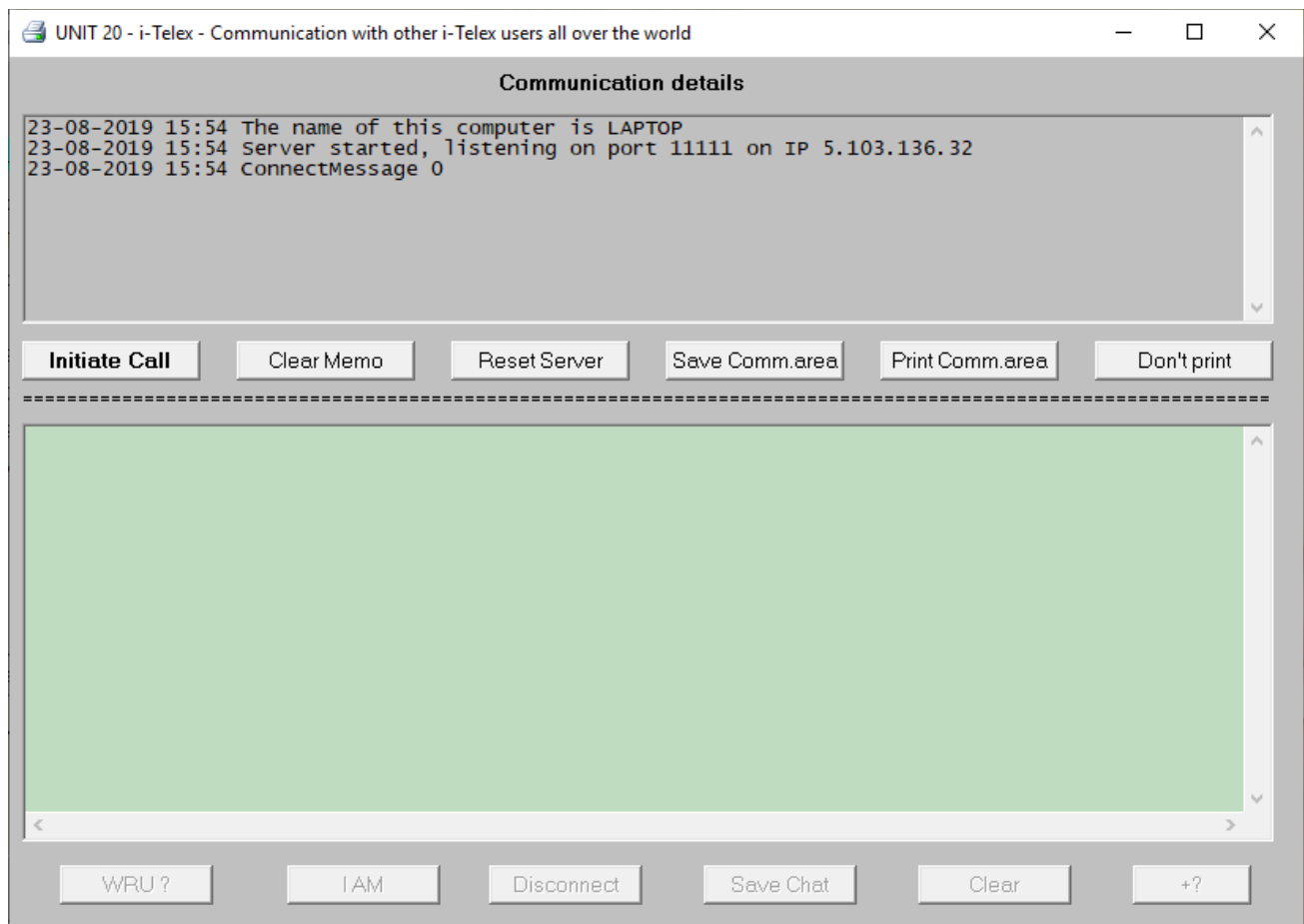
We have therefore implemented a visual version, show above. This screen shows that the teleprinter 31067 has received a message with a bell. The screen will pop up when the bell is printed, and will be present until the operator has closed the screen.

If other printers receive a BELL when this screen is displayed, it will be updated accordingly. PC's with a working sound card, will also be able to hear the alarm.

*NB : some teleprinters use a different character for BELL. This has not been tested. We have not been able to test this. Information would be appreciated.*

## 2.3 i-Telex

This part of the program enables you to communicate with other i-Telex subscribers, or to be more precise : any computer having an IP4 address. As the communication is Internet based, you will not be bothered by extra telephone bills or other costs.



This is the standard form of the i-Telex function, or in other words : you are now ready for receiving messages from other i-Telex subscribers.

We will now take a look at the control functions belonging to the Communication Area.

**Initiate Call** displays the local telephone book (refer to 2.3.2)

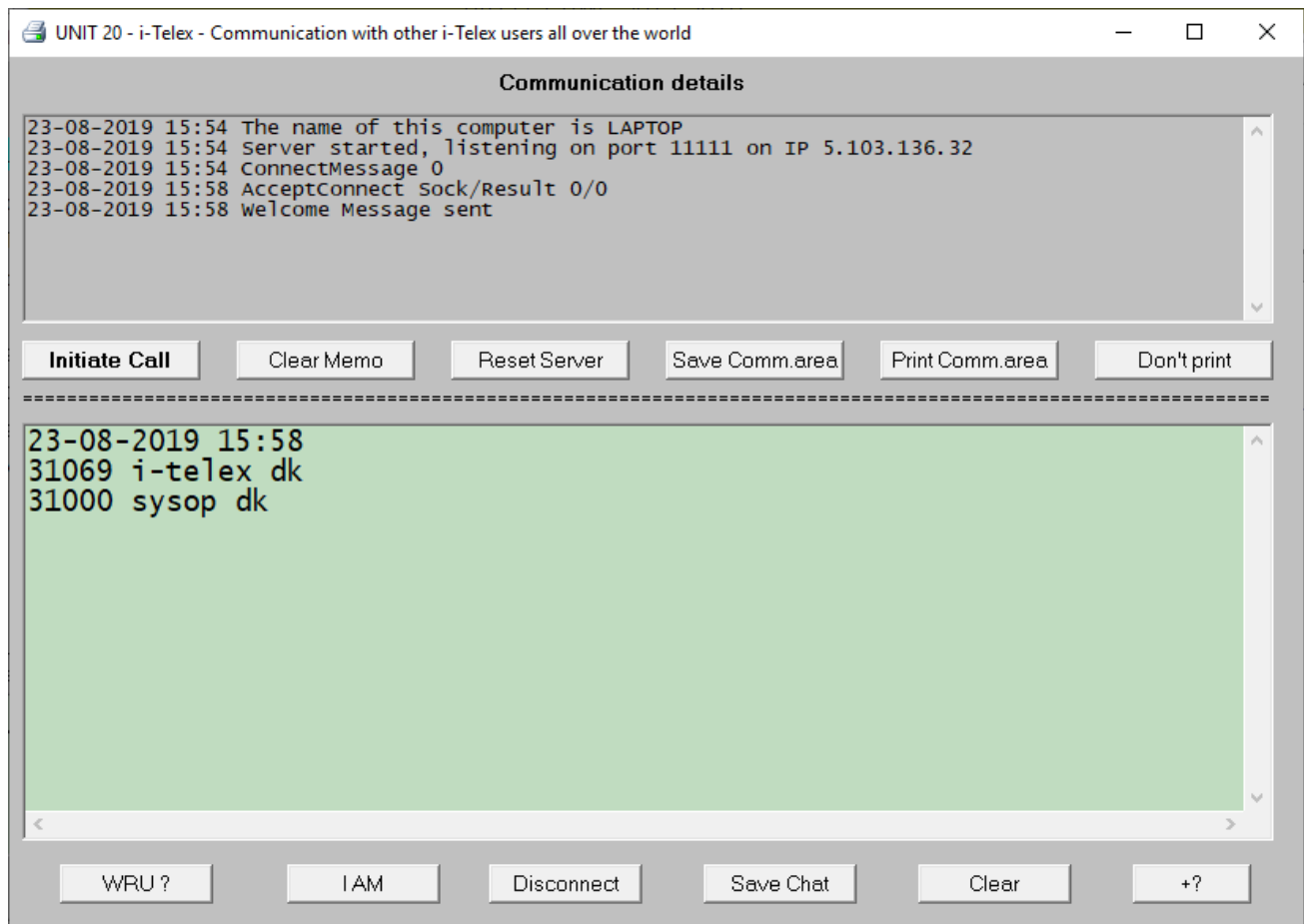
**Clear Memo** will erase the contents of the Communication Details

**Reset Server** can be used when the program gets confused or in case of errors.

**Save Comm Area** enables you to save the contents in a file. This could be handy for finding out where an error occurs.

**Print Comm Area** enables you to print the contents to a teleprinter. The green listbox shows which printer(s) can be used. Double-click on the relevant printer, and enjoy high-speed printing. If you regret, you can press **Don't Print**

### 2.3.1 Receiving i-Telex messages



The green part of the screen shot shows what happens when 31069 is called by subscriber 31067. The green part is in fact identical to what is printed on normal teleprinters. 31000 is the identification of 31067's SysOp.

First of all, we see a date and a time stamp. These values are generated by the caller, so they are not necessarily correct.

Line 2 is the identification belonging to your system.

After establishing a connection, it is considered good practice to identify yourself. The Caller does this by pressing the **I AM** button.

The reverse is done before the connection is broken, or to be more precise : the caller presses **WRU** and then presses **I AM** . This proves to the caller that the communication was not interrupted, and for you, it proves that you have received everything.



### 2.3.2 Transmitting i-Telex messages

Suppose that you want to call the i-Telex subscriber 31067.

Establishing a connection with another client, is accomplished by pressing **INITIATE CALL** and selecting the appropriate line.

As you can see, the screen is divided into 4 parts :

- 1) a directory containing the subscribers you created earlier;
- 2) 'Other subscriber ...': this entry is used when you want to call a subscriber which is not in the directory;
- 3) this directory is meant for establishing communication with non-i-Telex subscribers;
- 4) this is the most general one : you can connect to any IP4 address.

Possibility 1 and 2 send a command to a german directory server, which will return the data the program needs to establish a connection with the specified subscriber.

Possibility 3 and 4 require that the other part gives you the relevant data : IP4 address and a Port number.

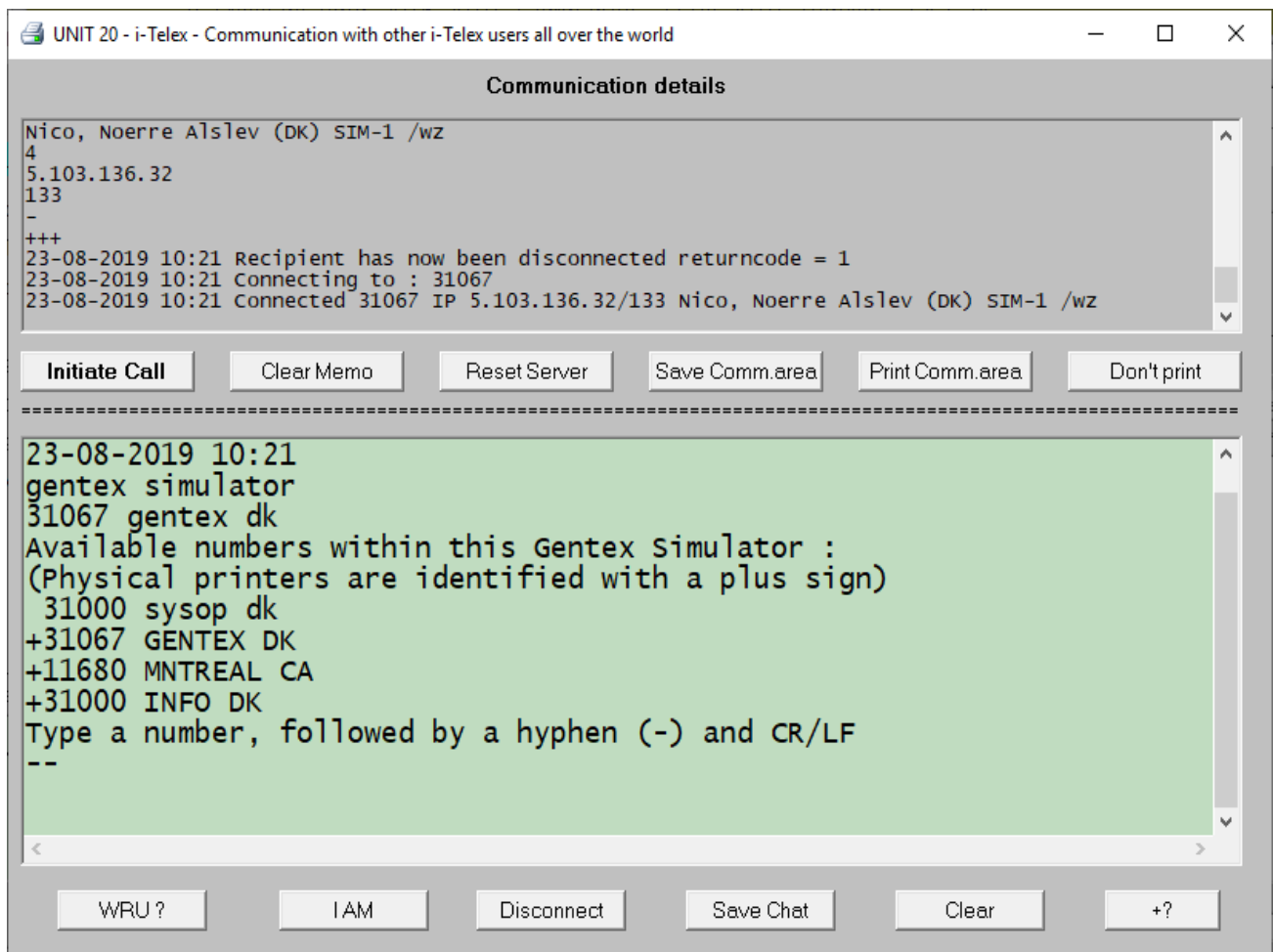
IP4 address	Port	Client description
172.17.0.007	1133	test
172.17.0.106	1132	henrik på den store pc
5.103.136.32	133	31067 gentex dk

Back to the previous screen : the bottom part shows the functions belonging to the communication proper.

Two standard teleprinter functions, **WRU** (Who are you) and **I AM** are implemented.

The contents of the memo can be saved by pressing **SAVE CHAT**

**+?** It is highly recommended to append **+?** to the end of what you want to say.. It indicates to the other part, that you have finished, so he can start writing. It avoids clashing communication, which is very annoying.



When the connection has been established, a greetings message is sent, like the one above.

It starts with a time stamp and a text, followed by the (local) subscriber number for the i-Telex sysop, followed by the number(s) belonging to the physical teleprinter(s) that is/are on-line at the moment.

Numbers belonging to a physical printer have a plus sign ( + ) in front of them.

The one without the plus sign, is the systems operator.

If no physical printers are attached to the system, no number will be shown, but a text saying

Connection redirected to SysOp

will occur.

The print below shows the first communication from the simulator to an i-Telex subscriber. The client scanned the output from the teleprinter and mailed the result. His printer would probably benefit from an adjustment and/or a cleaning.

```
eqpyu ra gv nl
available teleprinters within this gentex simulator :
31000 itelex dk
31095 sysop gtx
select a number, followed by a plus sign (e.g. 31000+)
the number must be entered on the keyboard
-----
31000+20.09 *
31000 itelex dk
test test test
hier heinz
+?
#
85- )
      2 = - =. ( ) das geht ja gut
prima +?
8: ?3(-. : 85-axprima +?
kommt bei mir aicbh habe jetzt mein server auf mein laptop :- ) +?
ok soll ich noch was machen+?
du hast die ehre der erste gaest auf mein laptop server zu sein
herzlichen gluckwunsch
kannst du bitte auch mal 31095 anrufen ?
ja mds 8't mein gentex sysop. +?
ja mach ich vielen dank fuer die
erst #-
8517242 spta d      testende

eqpyu ra gv nl
available teleprinters within this gentex simulator :
31000 itelex dk
31095 sysop gtx
select a number, followed by a plus sign (e.g. 31000+)
the number must be entered on the keyboard
-----
31095+20.14
31095 rb gv nl
test test test      hier heinz
+?
test test test+?
testende
+?
```

### 2.3.3 Sending i-Telex messages from a Teleprinter.

Using a teleprinter, it is extremely simple to connect to other i-Telex users.

You just enter a subscriber number, and end it with a plus (+) sign or a minus (-).

If you want to know the duration of a connection, you can use a question mark instead, (*not yet implemented*)

The number will first be checked against the local subscriber numbers known to the Simulator; if this gives no result, the e-mail aliases will be checked and only then the number will be presented to the i-Telex Server.

In other words, the numbers you use in your system, must be unknown to the german directory server, otherwise you will not be able to call the i-telex subscriber with that number.

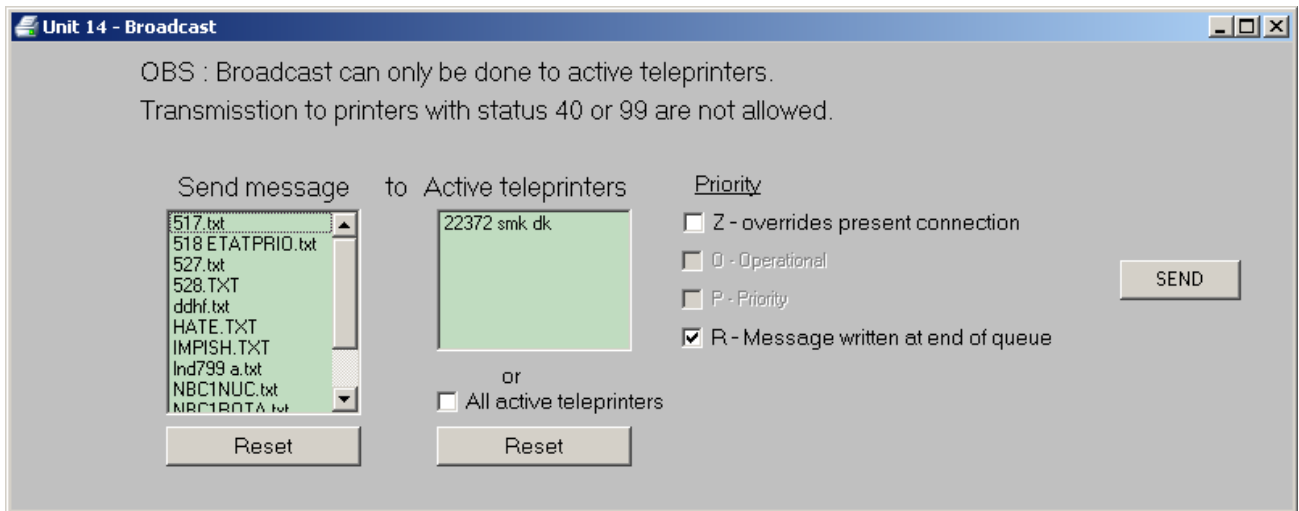
This is of course a problem when new i-Telex subscribers are entered, using a number already known to the Simulator.

If i-Telex is not activated, DER will be printed.

All these actions are transparent to the user, so the only thing you will see is the date and time-of-day and answer-back (if supported) from the called user.

It is of course no problem to call a subscriber with a Gentex Simulator. In this case, you will receive the standard greeting message, containing the available numbers, etc.

## 2.4 Broadcast



The system has the possibility to send the same message to more than one recipient simultaneously.

Select a message and one or more recipients, and press **SEND**.

The Active list does not contain 'out of service' teleprinters, i.e. printers with status 40 (Local) or 99 (Graveyard).

A primitive priority system can be used, to show the difference between Alarm (Z) and Routine (R) messages, as used in Defense related installations.

In this system, the difference between Z and R is that Z will cancel the ongoing activity (i.e. a communication between to clients will be terminated), while R will result in the message being queued, and sent to the printer after the present communication is concluded. (*needs a bit more testing*).

In real life, **Z** (Flash) is used only for the first message relating to an attack.

**O**(perational) is used for tactical messages; **P**(riority) is used for other important messages, while **R**(outine) is for the rest.

Broadcast to e-mail addresses is not implemented.

Broadcasting to many printers at the same time can be very stressing for a slow PC, so don't get alarmed.

## 2.5 Crypto

We've been extremely lucky to find a complete Siemens crypto system from the Cold War area; the Civil Defense authority being the original owner. What they needed encryption for, is beyond me. The purpose of such a system is to prevent nosy people from seeing your communications.



*Workshop installation*

### 2.5.1 Introduction

Encryption is a very large area; many excellent books have been written about it. It must therefore be sufficient with explaining items relevant to this system.

A fully useable system is as simple as this :

**Teleprinter > Mixer > telegraph line or radio link > Mixer > Teleprinter**

As you can see, there is no need for a telex exchange to be involved.

The encryption unit has 2 tape readers : one for the message to be sent, and one for a key tape. When transmitting a message, one character at a time is read from both tapes, and combined into a new character. How that works, is described in the Crypto Manual.

The encrypted character is forwarded to the recipient. On arrival it is combined with a character from the key tape<sup>10</sup>, which then produces a normal character, to be printed on the teleprinter.

---

<sup>10</sup> *It is obvious, that the key tapes need to be identical twins. If they are not complete identical, errors will occur. This might be acceptable for spoken language, but absolutely forbidden for e.g. UTM coordinates.*

The reason for connecting the crypto system to the Gentex simulator, is twofold :

- it shows very clearly that sending an encoded message makes it utterly incomprehensible;
- it shows the importance of keeping the key tapes inaccessible to others. This is shown by listening-in on the crypto connection via the PC. This will be explained later on.

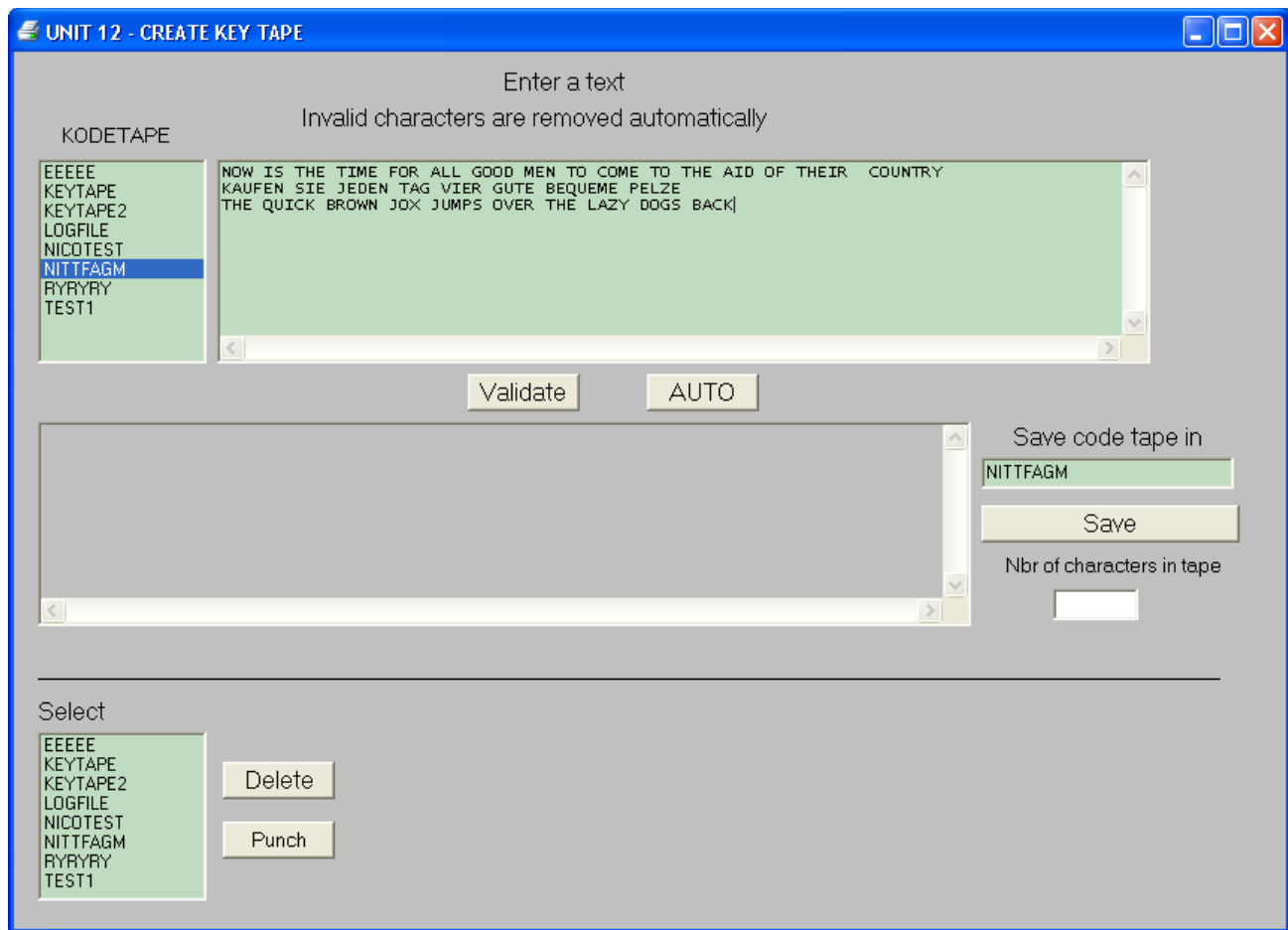
To emphasize the integral security of the system, we can tell you that an identical system has been used on the hot-line between Moscow and Washington.

The encryption system itself has never been classified; in fact, many have been sold to companies who wanted to keep certain details hidden from nosy competitors; the security comes only from the key tape.

In the old days, key tapes were classified as **NATO TOP SECRET**.

## 2.5.2 Producing a key tape.

How to produce a key tape is shown below :



The top window contains a normal text. You can write whatever you want, as invalid characters will be removed when the text is **VALIDATED**

VALIDATE does 3 things

- ensure that only valid characters are present;
- save the validated characters as a text file, e.g. for future corrections;
- prepare a machine readable copy of the text;

As an alternative, you can press **AUTO**. This will generate a 4096 character long key tape.

We now just need to send the text to the teleprinter attached to the encryption unit, so the operator has a key tape to use for the next messages. It goes without saying, that the key tape is to be sent to all teleprinters who need to use the same key tape.<sup>11</sup> An better way to distribute the tapes, is to copy them locally, and hand deliver them to the recipient.

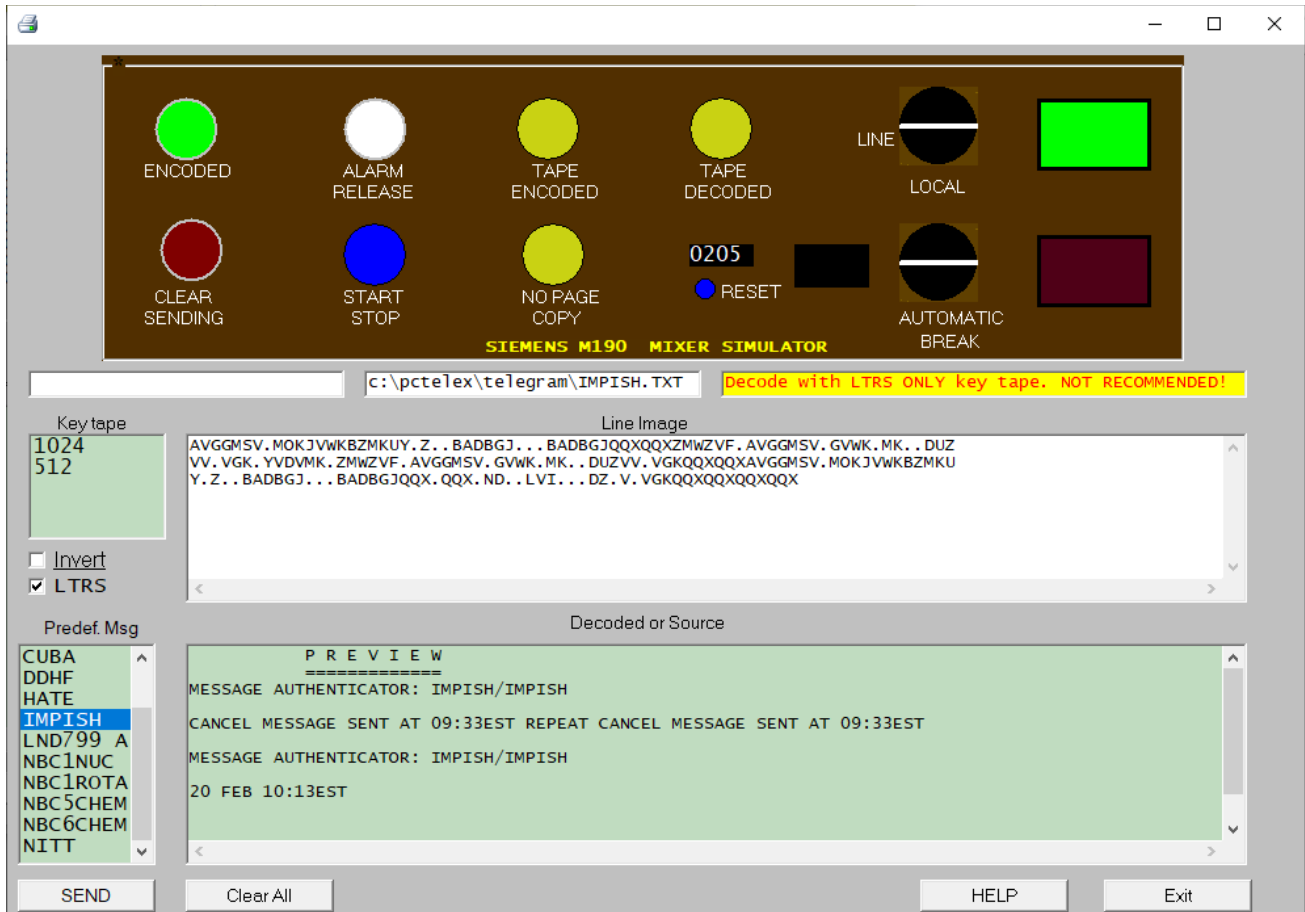
---

<sup>11</sup> This way of creating key tapes is of course totally forbidden in production environments. However, as the purpose here is to show techniques, there is no problem.



### 2.5.3 The M190 Simulator *(this part of the program is still under active deveopment)*

Not all installations will have access to a T100Z or similar, not to mention a proper M190 krypto mixer or equivalent, so developping a M190 Simulator was almost unavoidable<sup>12</sup>. This part is still "Work in Progress", but most functions are working properly.



Before we go in details, it should be said that the original purpose of this module was to be able to 'spy' on a line between two encryption systems, but it was soon realised that a Simulator could be very informative on how things were done not too long ago.

The brown part is a graphical representation of the Operator Panel of the Siemens M190 Mixer, as it was officially known. Those familiar with the M190's character counter, will see that it has been moved into the Operator panel. The same goes for the RESET button.

Below the panel, we see a listbox with a number of filenames, telling us which keytapes are presently known to the system. When you want to 'spy' on the line, you will need the same key tape as the one being used in the mixers. In practice, you will only be able to spy on the line when you are listening from the start, otherwise you will have synchronization problems.

The box **LINE IMAGE** shows what is going on on the line, apart from the fact that what you see here, is shown in ASCII, while what is sent, is the ITA2 representation of said character.

---

12 Thanks to Henrik Olsen, Danish Data Historical Society, for valuable input and explanations.

If you are listening in without having specified the correct key tape, or the correct key tape is out of sync with the one used between two systems, it will show utter nonsense (unless of course transmission is done in Clear Text).

The periods you see in the Line Image box, are not 'real' periods, but replacements for unprintable characters like Carriage Return, Bell, LineFeed, Answerback request, etc.

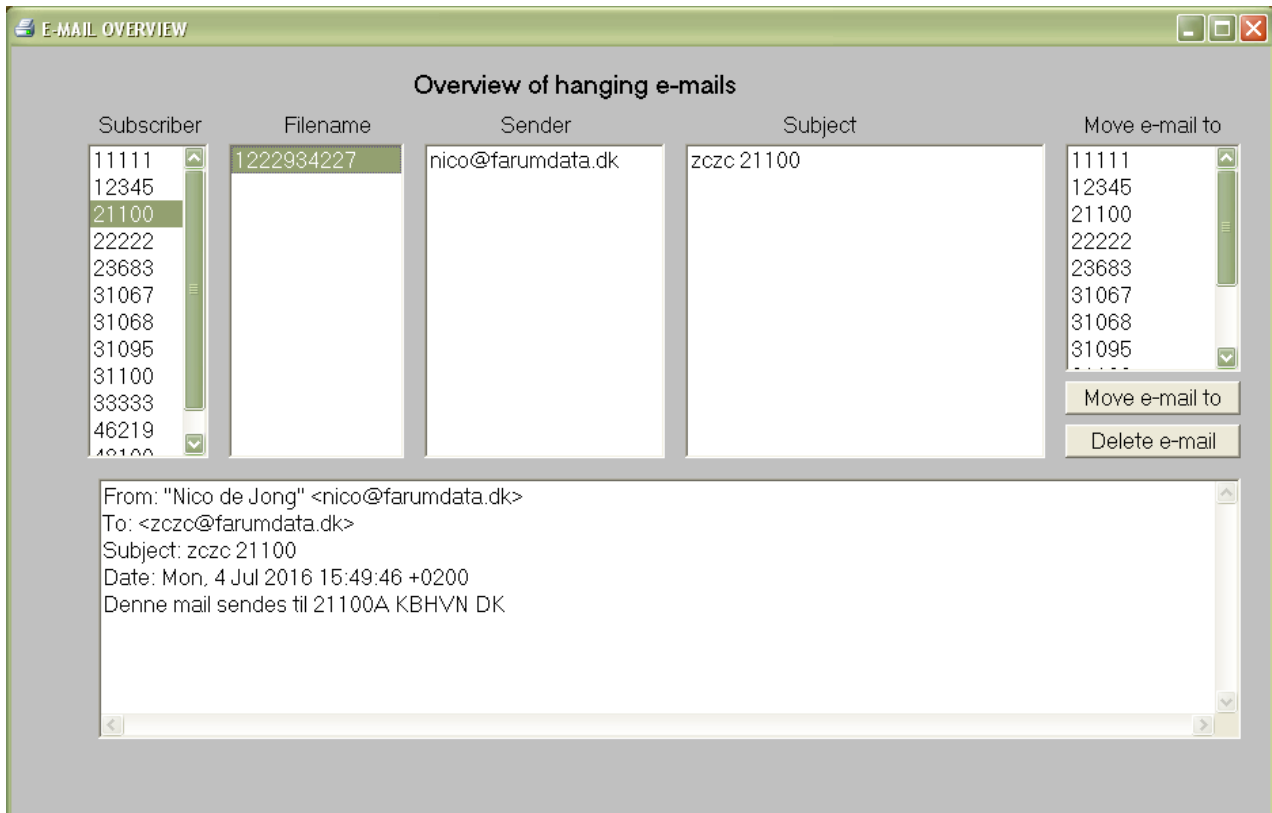
Speaking of AnswerBack, it is not recommended to eavesdrop with a normal teleprinter. Depending on the contents of the message and the key tape, we often see that most of the communication is printed at the end of the line. We can also see a lot of new lines, false WRU characters, etc. So, don't do it !

The box **DECODED** shows the same data, but now translated through the key tape, if relevant.

To the left of the DECODED box, you can see a list of filenames. These files are the same as the ones you can see in Predefined Messages.

A more detailed description on how to use this part of the program, and how to operate the Mixers, is explained in the Crypto Manual (after all, you COULD be lucky to find one...)

## 2.6 E-mail overview



The e-mail system does not know anything about which number is assigned to which teleprinter. Any correct e-mail will therefore be written the directory specified by the value behind **ZCZC**.

This gives the possibility of e-mails living eternally, when the number is now known to the Simulator. This overview should therefore be checked regularly, so e-mails can be rerouted or deleted. It should also be noted, that e-mails without **ZCZC** followed by a 5-digit number, will be deleted without further notice.

The lefthand column shows which teleprinters have waiting e-mails.

The second column shows the filename (which is not very informative, but needs to be used in order to retrieve the e-mail).

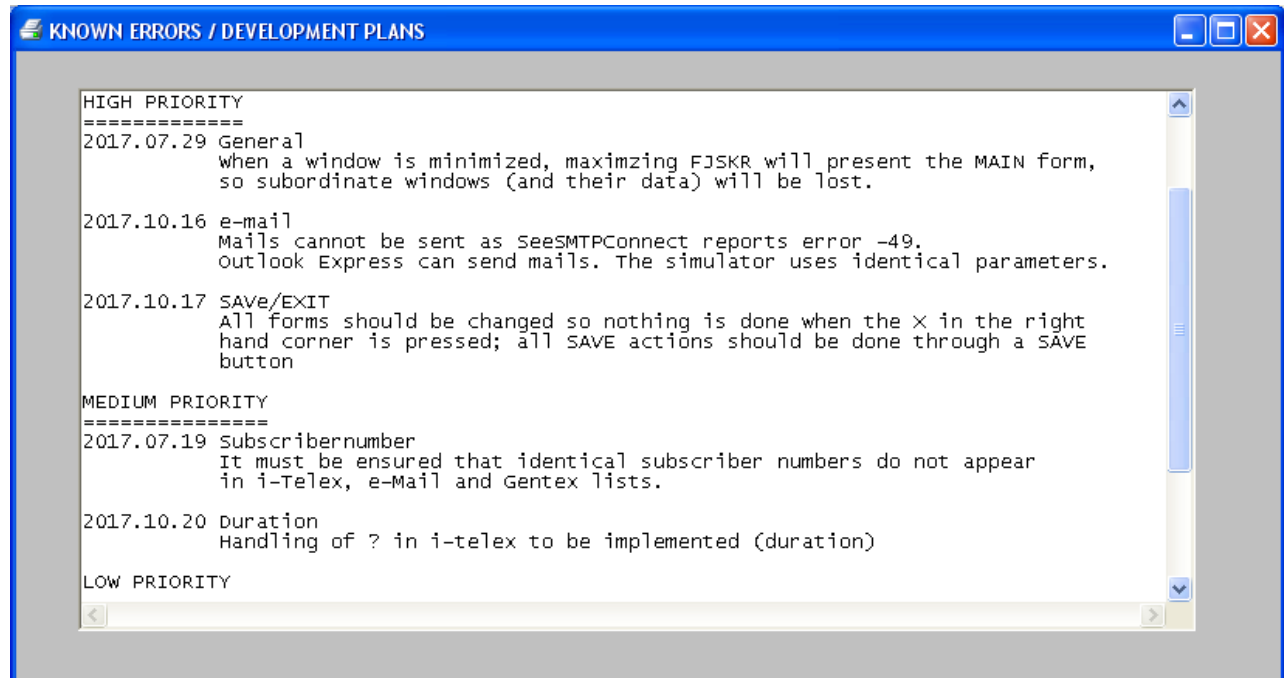
Selecting the filename will show the originator, the subject and the e-mail body.

We now have two possibilities: redirect the mail to another teleprinter, or to delete it.

## 2.7 About ...

### 2.7.1 Known Errors.

This screen shows a list of known errors.



## 2.7.2 About...



This screen shows some version details.

### **3. Here we go**

After activation of the RUN function, the Systems Operator can see what everybody else is doing.

Each teleprinter position can do only 3 things :

- initiate a call and send a message,
- make the position inaccessible.
- receive messages

The first thing is of course ok, but why make yourself invisible?

This is done for at least 2 reasons :

- if you need to prepare a papertape for later transmission, or
- need some time to change the paper roll and/or ink ribbon, without the chance of having your fingers mangled. Some systems, like (some) Siemens T100 are automatically shut off when you lift the cover.



**Typical Controlbox**

Press **Connect/Opkald** to initiate a call.

The system will now print the time of day.

Enter the subscriber number of the station you want to connect to.

Conclude the number with + - or ?

The + or – is the Gentex standard. If you want to be informed of the duration of the connection, you can end with a ?.

When the connection has been established, the system will print the answer-back of the receiving station. As a matter of good taste, you should always activate your own answer-back, so the other guy knows who he is talking to.<sup>13</sup>

When the communication has come to an end, you should always ask for the recipients answerback and send your own. This has a double benefit : the recipient can see that the connection is not terminated before time, and you can see that he has received all your words of wisdom.

Terminate the connection by pressing **Disconnect/Afbryd** .Now you will get printed the duration of the connection, if specified.

The final button is called **Local/Lokal**.

Pressing this button, identified with a small LED above it<sup>14</sup>, will logically disconnect the station from the PC, meaning that you are in fact incommunicado.

This is very useful when you want to change paper or ribbon, or when you want to punch a tape.

You should always be careful when you are messing around in the intestines of something mechanical. The best way to avoid any harm, is to disconnect the station from the mains.

Should someone try to call you while you are in **Local** he will get a line saying **DER** meaning : Out of Service.

---

<sup>13</sup> A few printers do not have this function, so here you will need to write something yourself.

<sup>14</sup> Some boxes have the LED inside the button

## **4 Hardware**

This chapter is not required reading for most people, but those who are interested in knowing how the system works can find some good info, making it possible to give solid answers to visitors, nosy clients, etc.

Remember, this is old, almost ancient, technology and not many people have seen teleprinters in action, or can even imagine what they were used for.

The project is based on a microprocessor based system, developed by Gil Smith, [gil@baudot.net](mailto:gil@baudot.net).

The full documentation can be found at [www.baudot.net](http://www.baudot.net). Some relevant files are supplied as .pdf files (tc-\*.pdf)

The system did not quite fulfill our wishes, as we needed some functions which were not available in Gil's hardware : CALL, DISCONNECT and LOCAL.

We also wanted to be able to accomodate non-ITA-2 teleprinters like the Teletype Model 33.

Therefore, we removed the microprocessor and its associated parts so we reduced it to a RS232 ↔ current loop system.

On top of that, we implemented the buttons you can see on the front of the box, so communication with the PC software would be made possible.

*(\* documentation to be supplied \*)*

We spoke previously of the problem getting US teleprinters connected to a COM port, as COM ports do not support the American standard speed of 45.45 BPS

A solution has been found; please refer to <http://www.aetherltd.com/connectingusb.html>

The software functions, originally located in the microprocessor, were implemented in a PC program. The language used is Delphi 6, which is a programming language from the 90's, which does not require a lot of resources. Remember that we are using an old PC.

The box is made up of 3 logical 'blocks' :

- a box with a 5VDC power supply and 3 buttons;
- a highvoltage power supply for the Current Loop;
- a print card with the conversion hardware.

Now take a look at diagram 1 (can be found in one of the pdf files)

This shows the power supply. We have only implemented the part of it called **HV1 Loop Supply**. Depending on which transformer was available , the output can be anything between 80-90 and 120-140 VDC. Siemens suggests a 110V supply, so we are not very far off.

Diagram 2 is the most interesting part.

At the right hand side, we see the most important parts in the system, making up the Current Loop. High-voltage is coming in at HV+, and goes via J50 (not present in the box) and J51 (which is the



connection to the teleprinter) down to R57 and R59, and then via Q50 to Ground.

The critical part is R57/R59, which make sure that the presented voltage results in a current of 40 mA (or 20, if we talk about a Teletype Model 33). This current is required by Siemens and many other teleprinters, so they can operate reliably.

For the 160 volt supply, the resistors are 2x 2K, 10W in series; (Ohms law says that 160 volt over 4000 ohm gives 40mA); the 80 volt supply can do with a bit under 2000 Ohm (2K and 5K6 parallel) to each other.

These parts make it possible to work with a teleprinter as "stand alone", so you can write, make tapes, etc.

When you want to talk to someone, a bit more is needed.

So, let's look at how we get signals from the current loop to the serial port.

Just below the +HV1, you see a Zenerdiode called 1N4733A. A Zenerdiode has the habit of conducting just like a normal diode, and at the same time it also gives a voltage drop, in this case 5.1 volt. This voltage drop goes via C51 and R52 to U50, which is a fototransistor. R53 is only present to limit the current.

When U50 gets a voltage, the built-in LED (light emitting diode) will light up and make the transistor part conduct, so we get a voltage over R55. In order to show the presence of the voltage, a small LED (DS51) and an accompanying current limiter has been mounted.

The underlying principle is, that a current loop is controlled by what is being sent, corresponding to the holes in a punched tape. When the current is interrupted, there will be no voltage drop across the zenerdiode, implying that U50 will block and this give no voltage over R55.

The voltage over R55 will be led to the serial IC. We will get back to that part.

We must also be able to print something originating from the PC.

This happens when the IC puts signals on U51, which also is a fototransistor. When a signal comes in, it will drive Q50 into saturation; missing signal will block Q50.

This will either block or 'open' for the current loop.

One thing we need to talk about, is the serial IC, a MAX232A or compatible, and the buttons.

The IC can be found on diagram 4.

What we will look at, are pin 11-14. Pin 11 is connected to U50. The purpose of the IC is to convert incoming current loop signals to standard RS232/V24 signals, which then via J2 and a cable are given to the COM port in your PC. These COM parts communicate with the Delphi program.

The signals coming from the PC, are connected to pin 13, are coming out on pin 12, and then fed to U51.

Looking at J2, you will see that 3 pins are connected to +5VDC.

These signals are called DCD, DSR and RI, and were originally used to tell the COM port that a carrier was detected (Data Carrier Detect), that the modem was ready (Data Set Ready), and that the modem had detected an incoming call (Ring Indicator)

These functions are now used by the box :

- CONNECT (Ring indicator gets 5V)
- LOCAL (Data Set Ready is grounded)
- DISCONNECT (Data Carrier Detect is grounded)

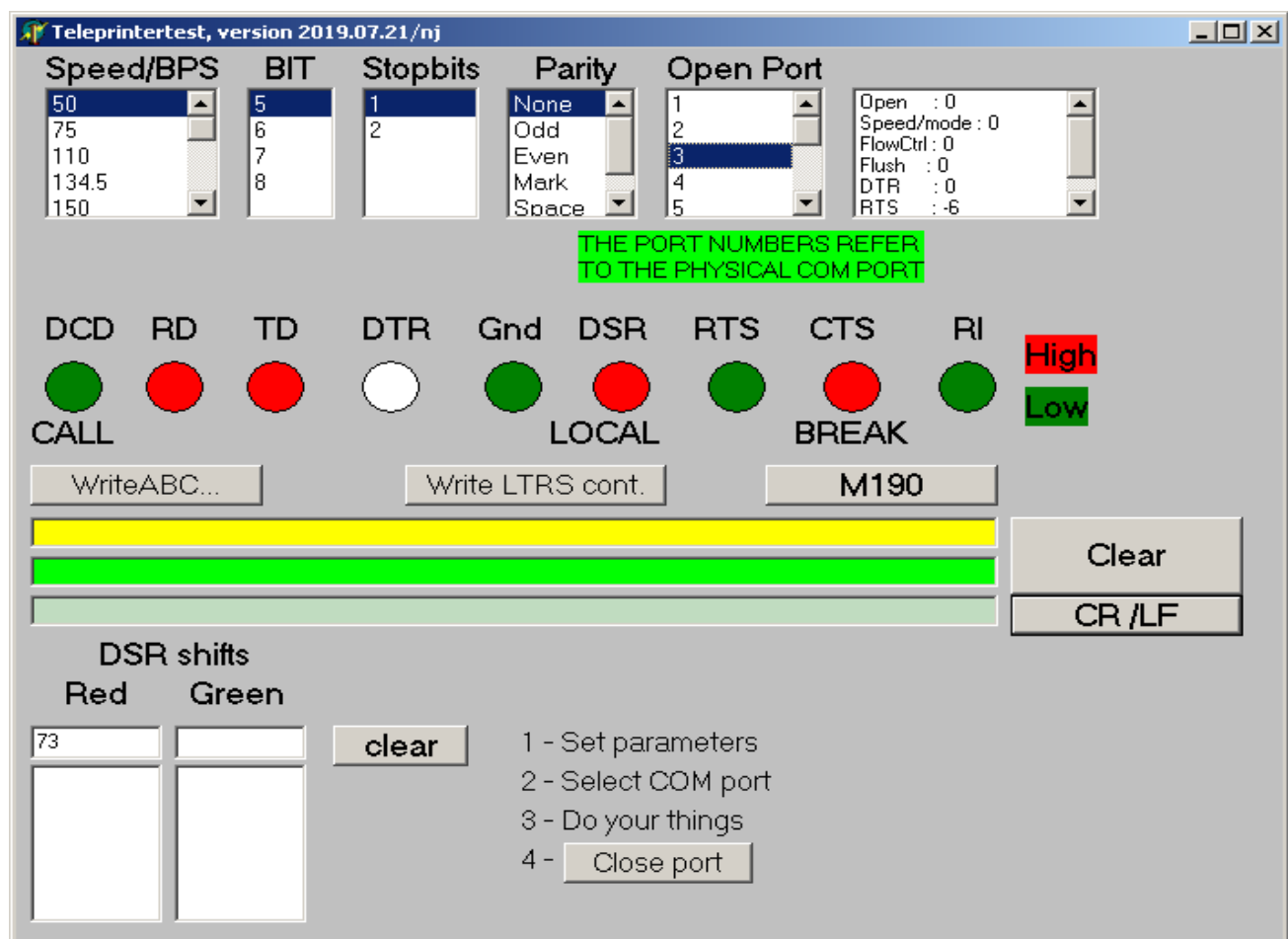
## 5 Teleprinter Test Program

### 5.1 Testing the connections and the teleprinter

When the physical installation is completed, it is recommended to use the Test program in order to check that everything works ok, before you start suspecting program errors.

For this purpose, the program **FJSKRTEST** has been developed..

Apart from testing the hardware, a few other handy subroutines have been implemented, but more about that later. The program can be modified/extended as the need arises., so your input is very welcome.



What we see here, is the main screen, showing that we are to test COM3; and the box connected to it.

We start by specifying the properties of the teleprinter connected to COM3. The small listbox to the right of **Open Port** shows the results of the commands given to COM3. All results should be 0.

When you press the **LOCAL** button on the control box, the field below DSR should change its color. **CONNECT** changes the color below **CD**, and **DISCONNECT** changes the color of the field below **CTS**.

These small tests show that (most of) the connection cable between PC and control box is OK. Now we can start testing the teleprinter.

**WRITE ABC** sends a small string containing CR, CR, LF to the printer, followed by 5x 'ABC', <bell> The shape below **TD** (transmitted data) should change color, showing that data is being sent.

**READ CONTINUOUSLY** has a double function : it is used to check the keyboard, but it is also continuously probing COM3 for incoming data. Incoming data is displayed in the yellow line; the same data, but this time in hex format, is written in the green line. n\*This way you can check the validity of incoming non-printable data.

**WRITE LTRS CONT.** is used to check that all channels function as they should. If they don't, any character can be printed. If you e.g. get a line of Z's, it shows that the 3 channels in the middle are not working as they should. How to fix that, is beyond the scope of this manual.

If your teleprinter has a punch attached to it, this function can also be used to verify that the punch is operating correctly.

Having opened the COM port you can type a text in the light-blue line, and send it to the printer.

**CLEAR LINE** clears the line.

The listboxes below **RED** and **GREEN** show how many times the status of DSR has shifted. If the status shifts unexpectedly, it can be an indication that there is too much noise on the line between control box and PC.

## 5.2 Testing the M/190 mixer/T100Z combination

While developing the M/190 Mixer interface, it was found that there was a need for some utility functions; hence the button **M/190**

The routine enables you to verify the workings of the Mixer, or more precisely : the functioning of each of the 5 channels.

Form2

Input: NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY

Encryption on channel:

- ☐
- ☐
- ☒
- ☐
- ☐

☐ Inverted

GO

Krypteret: \*MQ\*\*E\*HTS\*H\*OS\*DMC\*UPP\*VMMF\*OS\*\*HM\*RMOS\*HM\*HTS\*U\*F\*MD\*HTS\*C\*RMA\*HCZ

UNPRINTABLE CHARACTERS ARE SHOWN AS ASTERIXES

Send encrypted data

The screenshot shows the result of the entered text ('Now is the time ....') when encrypted with just a space. On a papertape, a space is represented with a hole in the 3<sup>rd</sup> channel.

If no channels are specified, the 'encrypted' text will be identical to the input data. And why is that ?

Form2

Input: NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY

Encryption on channel:

- ☐
- ☐
- ☐
- ☐
- ☐

☐ Inverted

GO

Krypteret: NOW\*IS\*THE\*TIME\*FOR\*ALL\*GOOD\*MEN\*TO\*COME\*TO\*THE\*AID\*OF\*THEIR\*COUNTRY

UNPRINTABLE CHARACTERS ARE SHOWN AS ASTERIXES

Send encrypted data

This is because XOR'ing a character with 0x00, results in the same character.

On the other hand, a keytape with just LTRS, corresponding to a keytape with holes everywhere, results in 'inverted' characters

Form2

Input: NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY

Encryption on channel: ☒ ☒ ☒ ☒ ☒ ☐ Inverted

GO

Krypteret: WUN\*BG\*KJV\*KBAY\*LUY\*MFF\*SUUP\*AVW\*KU\*ZUAV\*KU\*KJV\*MBP\*UL\*KJVBY\*ZUOWKYR  
UNPRINTABLE CHARACTERS ARE SHOWN AS ASTERIXES

Send encrypted data

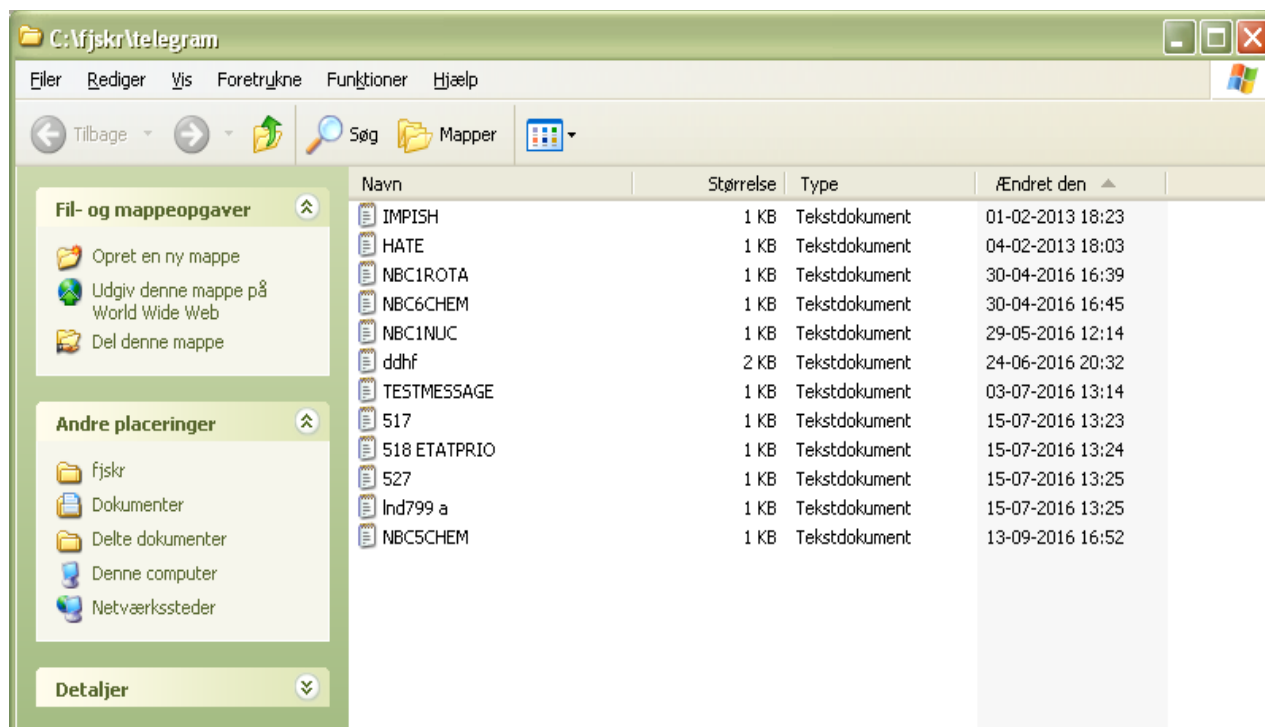
What does 'inverted' mean ? An example is that a 'Z', represented by O-.-O is inverted to a 'C', represented by -O.OO-

You will see, that the positions occupied by spaces, show asterixes. This is because an inverted space is a shift character, which is not printable, and therefore printed as an astrix.

Finally, attention should be given to the checkbox **INVERTED**. Activating this button will invert the encrypted characters. So, encrypting with all 5 channels set, PLUS INVERTED, is equivalent to encrypting without channels. Comes in handy when your printer does not have the NULL key.

## Appendix A, Predefined messages

In directory c:\pctelex\telegram we find the predefined messages.

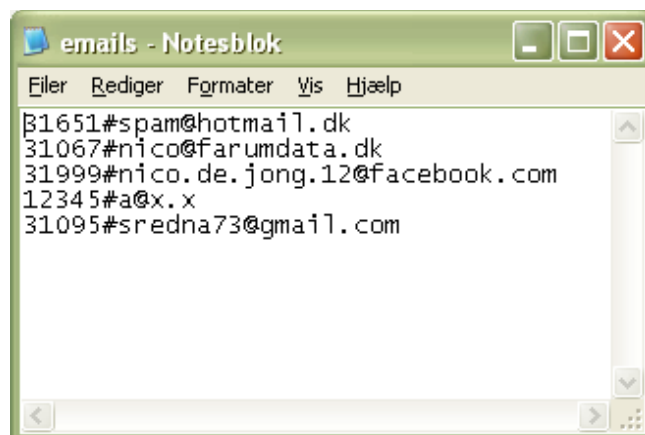


Here you can see the standard layout of a normal telegram



## Appendix B, e-mail addresses

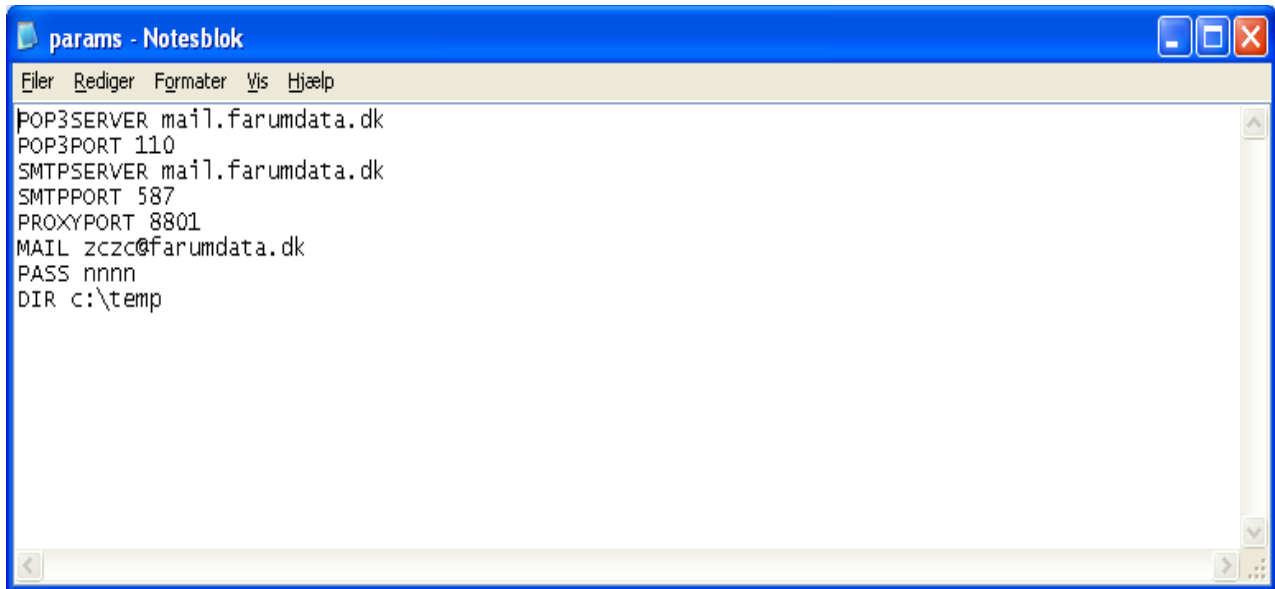
In the file c:\pctelex\data\emails.txt you can find the e-mail addresses.





## Appendix C, e-mail and ISP parameters

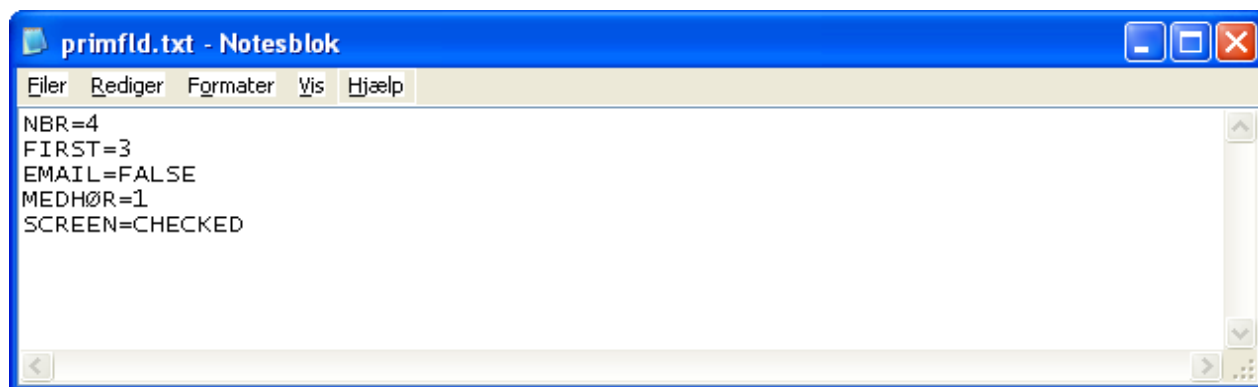
In c:\pctelex\data\params.txt you can find everything you need to connect to your ISP.



A screenshot of a Notepad window titled "params - Notesblok". The window has a blue title bar and a menu bar with options: "Filer", "Rediger", "Formater", "Vis", and "Hjælp". The text area contains the following parameters:

```
POP3SERVER mail.farumdata.dk  
POP3PORT 110  
SMTPSERVER mail.farumdata.dk  
SMTPPORT 587  
PROXYPORT 8801  
MAIL zczc@farumdata.dk  
PASS nnnn  
DIR c:\temp
```

## Appendix D, COM-port startvalues



C:\pctelex\data\primfld.txt tells you how many COM ports your PC has (not including the built-in ones), and the name of the first COM port on the expansion card.

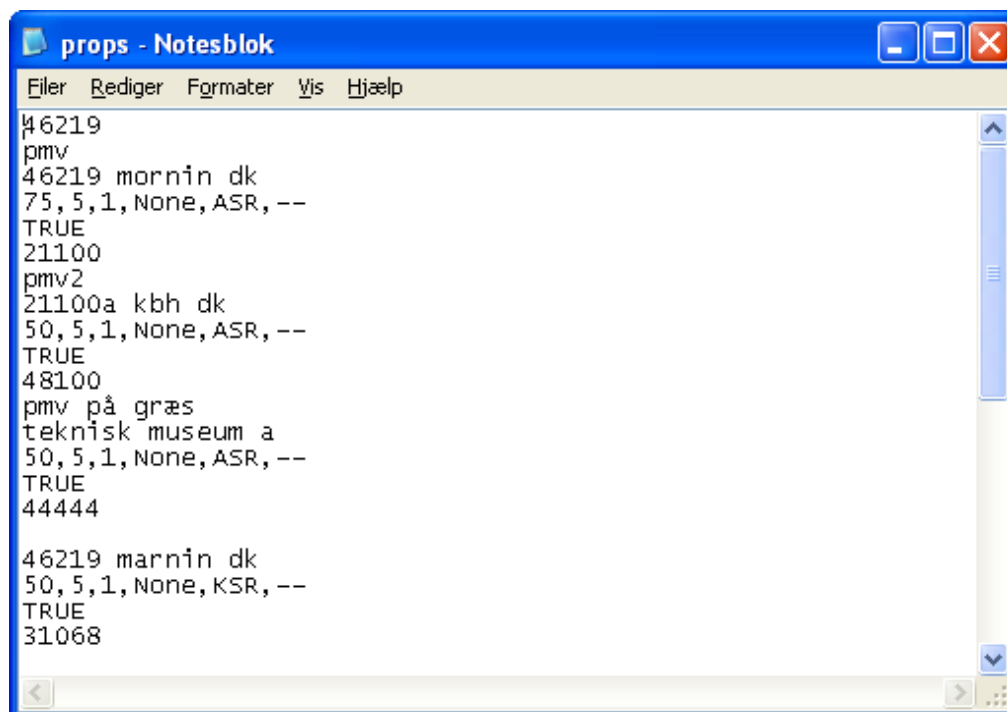
EMAIL indicates whether e-mail is activated or not.

MEDHØR tells us which port an eventual crypto system is connected to.

SCREEN informs us on whether the Listening-in function writes on a screen or on a printer.

## Appendix E, Teleprinter properties

The PROPS.TXT file, also located in c:\pctelex\data\, is the file where we save the properties describing one teleprinter.



```
46219
pmv
46219 mornin dk
75,5,1,None,ASR,--
TRUE
21100
pmv2
21100a kbh dk
50,5,1,None,ASR,--
TRUE
48100
pmv på græs
teknisk museum a
50,5,1,None,ASR,--
TRUE
44444

46219 marnin dk
50,5,1,None,KSR,--
TRUE
31068
```

## Appendix F, systemmessages

Just like the old Gentex system, we can expect some messages:

DERange – out of service

OCCupied – the number is occupied

Not Allowed –

No Cable – no more cables available (should not occur).

## Appendix G, software information

The program, apart from the i-Telex part, is written in a method called "States and Screens". You will probably be familiar with this method from your mini bank system.

The principle is, that states and screens belong together, and state change can only occur after the occurrence of a certain condition.

As an example I can mention the the minibankscreen where you can select the amount to want to withdraw. You can see amounts of e.g. 100, 200, 500, 1000, or 'other amount'

Each of these amounts corresponds to the button on the left or right side. Pressing this button generates an exit code, telling the program which state and screen are to be activated next, e.g. the state where the mini bank gives you the money. When that is done, you are often asked whether you want a receipt or not, but this time only 2 of the buttons are active, so either a receipt is printed, or the program returns to its starting point.

The same principle is used in the Gentex Simulator. However, it will not dispense any money..

The reason for using this method is that the up to 8 teleprinters, the system operator, and the e-mail routines all can have different states, so although the program as such for all teleprinters etc. is the same, the states and the variables belonging to the teleprinter, are not.

This simplifies the programming a great deal, as only one physical unit is considered at any given moment.

This way of programming is used only for controlling the teleprinters and e-mail functions, so routines like creating a key tape or modifying teleprinter properties, are not part of this, nor are the i-Telex routines.

Four states will occur very frequently :

- 00 – the task is communicating;
- 20 – the task is at the state where it is waiting for action;
- 40 – the printer belonging to this task, has been taken out of service (LOCAL is pressed)
- 99 – an irrecoverable error has occurred. This is the graveyard state.